VTM-200

Television Signal Monitors
Installation and Operation Handbook

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CAUTION — these instructions are for use by qualified personnel only. To reduce the risk of electric shock, do not perform this installation or any servicing unless you are qualified to do so. Refer all servicing to qualified service personnel.

To ensure safety:

- The unit should not be exposed to dripping or splashing, and no objects filled with liquids, such as vases, shall be placed on the unit.
- When the unit is to be permanently cabled, connect the protective ground conductor *before* making any other connections.
- Operate built-in units only when they are properly fitted into the system.
- For permanently cabled units without built-in fuses, automatic switches, or similar protective facilities, the AC supply line must be fitted with fuses rated to the units.
- Before switching on the unit, ensure that the operating voltage set at the unit matches the line voltage, if appropriate. If a different operating voltage is to be set, use a fuse with the appropriate rating. Refer to the Installation Instructions.
- Units of Protection Class I with an AC supply cable and plug that can be disconnected must be operated only from a power socket with protective ground contact:
  - Do not use an extension cable—it can render the protective ground connection ineffective.
  - Do not intentionally interrupt the protective ground conductor.
  - Do not break the protective ground conductor inside or outside the unit or loosen the protective ground connection; such actions can cause the unit to become electrically hazardous.
- Before opening the unit, isolate it from the AC supply. Then ensure that:
  - Adjustments, part replacements, maintenance, and repairs are carried out by qualified personnel only.
  - Safety regulations and rules are observed to prevent accidents.
  - Only original parts are used to replace parts relevant to safety (for example, the power on/off switches, power transformers, and fuses).
- Replaceable fuses can be hazardous when live. Before replacing a fuse, disconnect the AC power source.
- Use caution when cleaning the equipment; isopropyl alcohol or similar solvents can damage or remove the labels.
- Observe any additional safety instructions specified in this manual.

These symbols may appear on Videotek equipment:

Explanation of Symbols

Read the *Operator's Handbook* or the *Service and Instruction Manual* and observe the safety symbols used.

Unit ground

Caution: shock hazard

Equipotentiality

Protective ground connection

Ground

Blank Page

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Section 1 ♦ Introduction

The VTM-200[1] is a 19" rackmounted unit that accepts two NTSC or PAL composite video signals, two component serial digital inputs (per ITU-R BT.601 and SMPTE 259M @ 270 Mb/s) at either 50 Hz or 59.94 Hz field rates, and an external analog reference video signal. In addition, the VTM-200 optionally accepts four analog audio stereo pairs, and four AES/EBU standard serial digital stereo pairs. The VTM-200 allows for user selection of one of the video signals, plus two of the stereo pairs, and creates RGB and sync signals suitable for driving a computer SVGA monitor at 800 x 600 pixel resolution. The display presents the image carried by the selected video input as a real-time, full motion picture; the waveform and vector representations of that input; and the audio levels of the selected audio inputs, including phase differences between the left and right channels of each of the stereo pairs. Front panel user controls allow for various display and selection modes. An on-screen menu allows the user to set up default conditions. Additional control can be exercised through the use of a computer keyboard interface, and a GPI/TALLY connector.

Features include:

- Two Analog Composite and two 601 Serial Digital inputs
- Replaces two waveform monitor/vectorscopes, an audio test set, and two video monitors
- Dedicated buttons for all common functions
- Versatile user configuration
- SVGA display output
- Zoom view on waveform Black (0 Units) and White (100 Units)
- Zoom view on vectors each quadrant plus a center zoom for checking each color and black/white balance
- Zoom view on audio to set 0 dB reference
- One rack unit high
- Universal switching power supply: 90 to 260 VAC, 50 or 60 Hz

Options include:

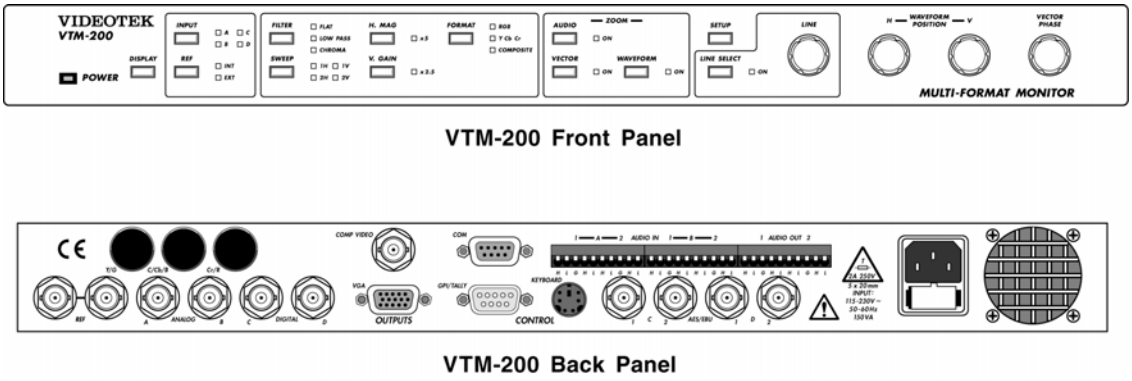
- One composite video output for NTSC and PAL monitors
- OPT-1: Audio processing board
- *VTM-180 & VTM-200 Service and Instruction Manual*

The VTM-200 is the perfect solution for unattended signal quality monitoring of multiple sites.

The front and back panels of the VTM-200 are illustrated in **Figure 1-1.**

[1] This instrument is protected by US Patent 6,069,607. Other US and foreign patents pending.

Figure 1-1. VTM-200 Front and Back Panels



For information on the RCU-200, see Appendix D, “Remote Control Unit (RCU-200).”

Section 2 ♦ Installation

This section provides information about inspecting the VTM-200 shipment and installing the unit.

Inspecting the Shipment

Before installing the VTM-200, inspect the box and its contents. Report any damage to the shipper and telephone Videotek's Customer Service Department for service support (see Appendix B, "Service Support").

The box contains the following:

- The VTM-200
- One *VTM-200 Installation and Operation Handbook*
- One 75Ω high-frequency terminator
- One power cord
- Hardware kit, Item Number 045592, for rackmounting the VTM-200

Save the box and packing material for any future shipping requirements.

Installing the VTM-200

The following subsections provide instructions to rackmount, connect, and configure the unit.

COM Port Electrical Interface Selection

CAUTION — these instructions are for use by qualified personnel only. To reduce the risk of electric shock, do not perform this installation or any servicing unless you are qualified to do so. Refer all servicing to qualified service personnel.

The COM interface on the VTM-200 as well as the Remote Control Unit (RCU-200) normally uses an EIA-232 electrical interface for communications. Both the RCU and the VTM units are capable of utilizing an alternate cable interface, RS-422, which permits longer inter-unit cabling distances. In order to support an RS-422 connection the internal jumpers must be reconfigured. See Interface Mode Jumper Configurations for more details.

Interface Mode Jumper Configurations

In order to utilize the RS-422 interface, internal jumpers in both the VTM and RCU units must be repositioned. **Table 2-1** details the jumper configuration for the VTM-200 (for more information on the RCU-200, See Appendix D, "Remote Control Unit (RCU-200)"). All signal and power cabling should be removed from the units before disassembly.

The jumpers on the VTM-200 are located near the back connector area of the VTM204 board. In a VTM-200 with an audio option board installed, the jumpers would be located under the audio option board, which must be temporarily removed in order to reconfigure the jumpers.

Table 2-1. Jumper Configuration for RS-422 Interface

Connection	Jumper CN1	Jumper CN3	Jumper CN5
EIA-232	Connect 1-2	No connection	No connection
RS-422	No connection	Connect 1-2	Connect 1-2

Rackmounting the VTM-200

Rackmount the VTM-200 with the enclosed rackmounting support rails. The ideal situation would leave one rack unit (1.75") above and below the VTM-200 open. When selecting the permanent mounting location for the VTM-200, ensure that the flow of air to the ventilation holes on the top and sides of the chassis is not obstructed. Rackmounting of the VTM-200 is illustrated in **Figure 2-1**; the parts required to rackmount the VTM-200 are listed in **Table 2-2.**

Figure 2-1. Mounting the VTM-200 in Rack

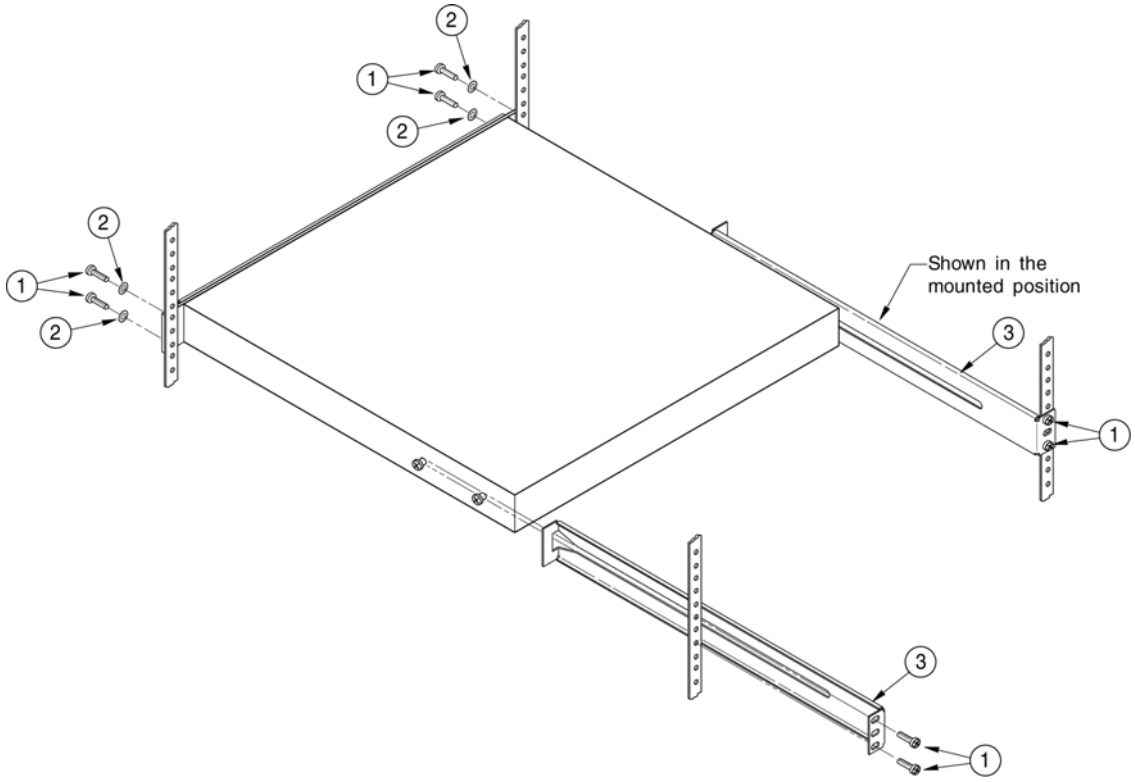


Table 2-2. Parts Required to Rackmount the VTM-200

Key	Item Number	Quantity	Description
1	044030	8	Hardware screw #10-32 x ¾ pan head.
2	045020	4	Hardware nylon washer
3	200076	2	Metal rack extension bracket

Rack-extension mounting brackets are mounted to the back of the rack cabinet. Once in place, guides on the unit will slide in and out of rack extensions for easy installation and removal.

Connecting the VTM-200

The back panel connectors are illustrated in **Figure 2-2**; the function of each connector is described in **Table 2-3.**

Figure 2-2. VTM-200 Back Panel Connectors

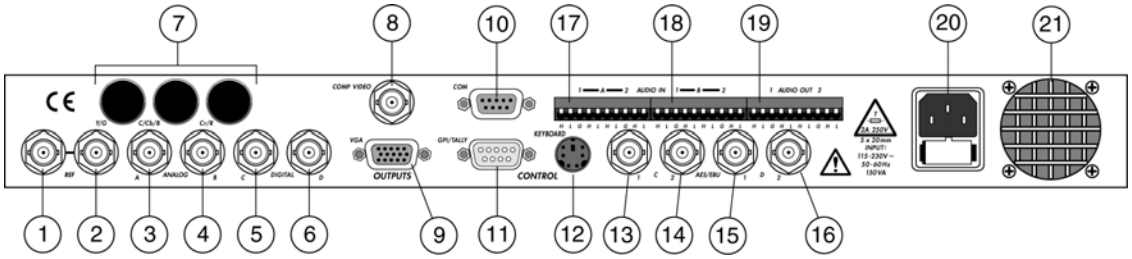


Table 2-3. Description of Back Panel Connectors

Key	Label	Description
1	REFERENCE	BNC connector that connects to an external NTSC/PAL reference signal (video or blackburst) from which the horizontal and vertical sync, and the color burst frequency for the VTM-200 will be derived if EXT has been selected as the REF source. If these connectors are not looped through, then the unused connector must be terminated in 75Ω.
2	REFERENCE	BNC connector that connects to an external NTSC/PAL reference signal (video or blackburst) from which the horizontal and vertical sync, and the color burst frequency for the VTM-200 will be derived if EXT has been selected as the REF source. If these connectors are not looped through, then the unused connector must be terminated in 75Ω.
3	A (ANALOG VIDEO INPUT)	BNC that connects to an NTSC or PAL analog composite signal in the amplitude range of 0.5 to 2V p-p with a maximum of ± 3.0 volts of offset on it.
4	B (ANALOG VIDEO INPUT)	BNC that connects to an NTSC or PAL analog composite signal in the amplitude range of 0.5 to 2V p-p with a maximum of ± 3.0 volts of offset on it.
5	C (DIGITAL VIDEO INPUT)	BNC that connects to a serial digital stream at 270 MHz per recommendation ITU-R BT.601 and SMPTE 259M standard. Either 525 line at 60 Hz field rate or 625 line at 50 Hz field rate signals are accepted.
6	D (DIGITAL VIDEO INPUT)	BNC that accepts a serial digital stream at 270 MHz per recommendation ITU-R BT.601 and SMPTE 259M standard. Either 525 line at 60 Hz field rate or 625 line at 50 Hz field rate signals are accepted.
7	HOLE PLUGS	Reserved for future functionality.
8	COMPOSITE VIDEO OUTPUT JACK	Option. NTSC or PAL depending on video output format.

(Table continues on next page)

Table 2-3. Description of Back Panel Connectors (continued)

Key	Label	Description
9	VGA (OUTPUTS)	Female, 15-pin, “D” connector that provides the analog RGB signals and the vertical and horizontal sync signals necessary to operate a standard SVGA monitor at 800 x 600 resolution.*
10	COM (CONTROL)	Female, 9-pin, “D” connector that allows RS-232/RS-422 communication with the RCU-200 or the PC. The communication parameters are no parity, 8 data bits, and baud rate selectable from the SETUP menu (as shown in **Table 3-5** on page 3-18).*
11	GPI/TALLY (CONTROL)	Male, 9-pin, “D” connector for remote selection of the video input by accepting momentary contact closures to the Channel Select Return line. It also accepts a continuous contact closure to the ON AIR Return line to indicate ON AIR status by causing the on-screen ON AIR indicator area to turn red. The Error Summary signal, the only output of this connector, is the normally open contact of a relay that makes contact with Error Summary Return for approximately one second, if the selected input is from a serial digital source, and an EDH or Data Error occurs.*
12	KEYBOARD	6-pin, mini, DIN connector for an IBM PS2-style keyboard connector to allow user remote control of the VTM-200.*
13	AES/EBU IN C1	BNC connector for an AES/EBU serial digital stream carrying a stereo pair of audio channels. The 18 most significant bits of each channel are converted to analog form. If selected for display and output via the AUDIO FOLLOW Menu Items, the analog audio derived from the selected AES/EBU input will appear at the AUDIO OUT connector with an attenuation determined by the AES/EBU AUDIO LEVEL Menu Item. Its levels and phase difference will be displayed in the on-screen audio display.
14	AES/EBU IN C2	Same as 13.
15	AES/EBU IN D1	Same as 13.
16	AES/EBU IN D2	Same as 13.
17	AUDIO IN A1, A2	Twenty screw-terminal connectors for eight analog audio signals (four stereo pairs). Each signal input accepts a balanced input (H, L) and a shielded ground (G). If selected for display and output via the AUDIO FOLLOW Menu Items, the analog audio will appear at the AUDIO OUT connector with an attenuation determined by the ANALOG AUDIO LEVEL Menu Item. Its levels and phase difference will be displayed in the on-screen audio display.
18	AUDIO IN B1, B2	Same as 17.
19	AUDIO OUT 1, AUDIO OUT 2	Ten screw-terminal connectors that output the two analog audio stereo pairs selected by the AUDIO FOLLOW Menu Items. The gain of the audio is determined by the AES/EBU AUDIO LEVEL and ANALOG AUDIO LEVEL Menu Items. Its levels and phase difference will be displayed in the on-screen audio display.*
20	INPUT POWER	Three-prong power connector that accepts nominal 115V AC to 230V AC, 50 to 60 Hz single phase to power the VTM-200. The VTM-200 will auto detect the supply voltage, and adjust itself to it. The connector incorporates an inline 5 x 20 mm 2.0 A time-lag fuse.
21	FAN	Seven-cfm fan operates whenever power is applied to the VTM-200, and functions to cool the VTM-200. It exhausts air out of the unit.

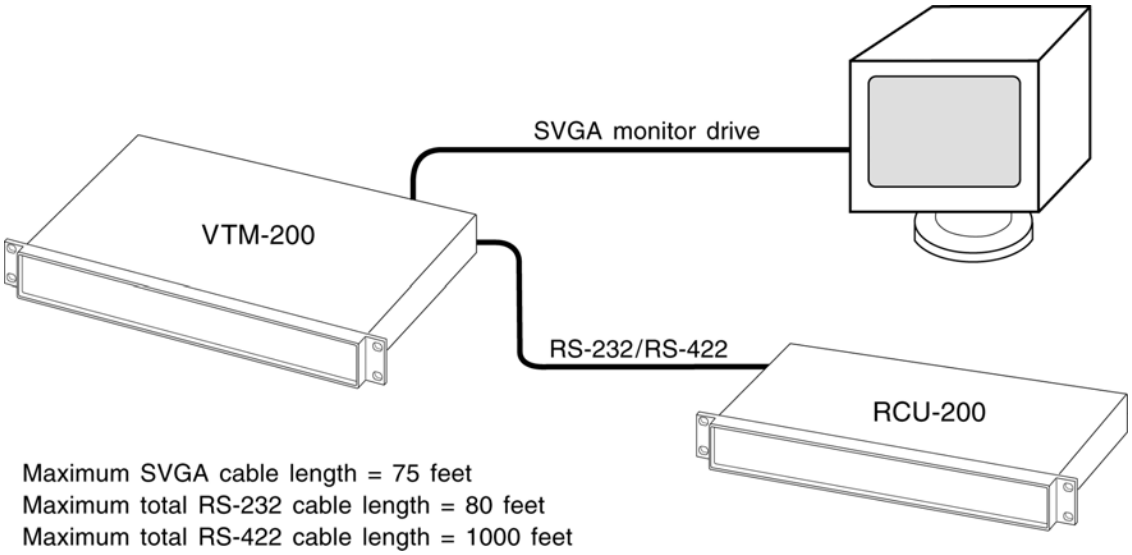
***See Appendix C, “Pinouts,” for the connections.**

Configuring the VTM-200 for Remote Control

For the following configuration, the interconnecting cables can be extended using electronic distribution. To configure the VTM-200 for remote control:

- One RCU-200 connected to one VTM-200 using the COM port

Figure 2-3. Connecting the RCU-200 Remote Control Panel


SVGA monitor drive
VTM-200
RS-232/RS-422
RCU-200
Maximum SVGA cable length = 75 feet
Maximum total RS-232 cable length = 80 feet
Maximum total RS-422 cable length = 1000 feet

Section 3 ♦ Operation

The VTM-200 provides a rasterized output picture/waveform/vector/audio display on an SVGA monitor with an on-screen menu system for operator setup of the unit. The front panel controls allow for selection of inputs, filters, display parameters, and display formats.

Front Panel Controls and Indicators

The front panel controls and indicators are illustrated in **Figure 3-1**; the function of each control or indicator is described in **Table 3-1**.

Figure 3-1. VTM-200 Front Panel Controls and Indicators

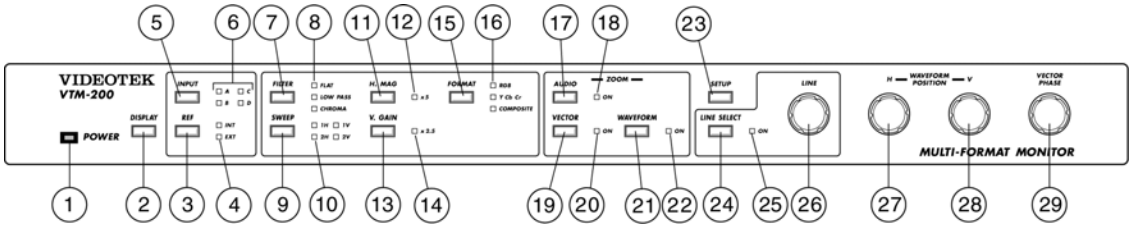
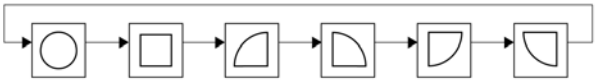


Table 3-1. Description of Front Panel Controls and Indicators

Key	Label	Description
1	POWER	LED lights to indicate that power is applied to the VTM-200.
2	DISPLAY	Press to cycle through the SVGA display from a four-quadrant display to a full screen display of the picture being processed, a full screen waveform display, a full screen vector display, a full screen audio levels display if the OPT-1 option is installed, and then the four-quadrant display once more.
3	REF	Press to select either the externally applied signal at the REFERENCE input or the signal being processed to function as the source for horizontal and vertical sync and color reference.
4	INT, EXT	LED lights to indicate that the source of reference is either internal or external.
5	INPUT	Press to select signal A, B, C, or D for subsequent processing and display.
6	A, B, C, and D	LED lights to indicate which signal is being processed and displayed. The signal can be selected by the front panel INPUT button, by contact closures at the TALLY connector or by a keyboard connected to the keyboard connector.
7	FILTER	Press to select an NTSC/PAL signal that undergoes no filtering (FLAT), LOW PASS filtering, or CHROMA filtering.
8	FLAT, LOW PASS, CHROMA	LED lights to indicate the filter that has been selected.

(Table continues on next page)

Table 3-1. Description of Front Panel Controls and Indicators (*continued*)

Key	Label	Description
9	SWEEP	Press to cycle the waveform between 1H (one horizontal line of video), 2H (two successive lines of video), 1V (one vertical field of video), or 2V (two successive fields of video).
10	1H, 2H, 1V, 2V	LED lights to indicate which SWEEP is currently in operation.
11	H. MAG	Press to select, for the waveform display, either a normal horizontal sweep or a sweep that has been horizontally magnified by a factor of 5.
12	x5	LED lights when the horizontal waveform sweep has been magnified by a factor of 5.
13	V. GAIN	Press to select, for the waveform display, either a vertical gain of 1 or a vertical gain of 2.5.
14	x2.5	LED lights when the vertical waveform gain has been increased by a factor of 2.5.
15	FORMAT	Press to select the format in which the waveform is displayed. Component video at the C or D video inputs can be displayed as either RGB components (which may be paraded or overlaid) Y, C_B, C_R components (which may be paraded or overlaid), or as an equivalent COMPOSITE waveform which has been synthesized internal to the VTM-200. The waveforms of NTSC/PAL signals at the A or B video inputs can only be displayed in COMPOSITE format. The vectors display for component video inputs displays Cb vs. Cr. The vector display for composite video inputs displays B-Y vs. R-Y.
16	RGB, YC_BC_R, COMPOSITE	LED lights to indicate which display FORMAT has been selected.
17	AUDIO (ZOOM)	This button has a dual purpose: ▪ Press to select, for the audio levels display, either the SETUP pre-selected scales calibrated in dB or scales that have been zoomed in the region of 0 dB to display more detail. ▪ When the SETUP menu is displayed, this button functions to select only those items concerned with audio, and forces the menu to appear in the screen quadrant normally occupied by the vector display. This button is active only when the OPT-1 option is installed.
18	ON (AUDIO ZOOM)	LED lights when the audio scales have been zoomed to present a more detailed display.
19	VECTOR (ZOOM)	Press to cycle through the vector display through different views. These include normal display, center zoomed display, and one vector quadrant zoomed display, as follows: 
20	ON (VECTOR ZOOM)	LED lights when a vector display other than the normal display is shown.

(Table continues on next page)

Table 3-1. Description of Front Panel Controls and Indicators (*continued*)

Key	Label	Description
21	WAVEFORM (ZOOM)	This button has a dual purpose: ▪ Press to cycle through the composite waveform display between its normal display of -50 to 120 IRE levels, a display zoomed around a center value of 0 IRE ± 20 IRE, and a display zoomed around a center value of 100 IRE ± 20 IRE. The PAL waveform, when displayed as volts, cycles between -0.1 to +0.7 volts, 0 ± 0.1 volts, and + 0.7 ± 0.1 volts. This button has a dual use. ▪ When the SETUP menu is displayed, this button functions to select only those items not concerned with audio, and forces the menu to appear in the screen quadrant normally occupied by the audio levels display.
22	ON (WAVEFORM ZOOM)	LED lights when the waveform display is zoomed around either 0 IRE or 100 IRE in composite mode; +0.0 or +0.7 volts in component mode.
23	SETUP	Press to enter or exit the SETUP menu.
24	LINE SELECT	Press to enter or leave the line select mode. In this mode, the waveform and vector displays show only one line out of an entire two-field frame of video. When not in the line select mode, the displays accumulate all of the video lines, with those occurring earlier in time decaying in brightness, simulating the persistence of the phosphor in an ordinary oscilloscope CRT.
25	ON (LINE SELECT)	LED lights when in the line select mode, displaying only one line.
26	LINE	Rotate to select which line the waveform and vector displays when line select mode is operative. The line number and field identification are displayed at the bottom of the waveform display. For an NTSC or 525/60 signal, 1 odd to 263 odd, 1 even to 262 even are shown. For a PAL or 625/50 signal, line number ranges from 1 to 625, with lines 1 through 313 being designated in the odd field, and lines 314 through 625 being in the even field. Clockwise rotation of the LINE control increases the selected line number; counterclockwise rotation decreases it. For component displays, each component is individually shown before the line number is incremented or decremented.
27	H (WAVEFORM POSITION)	This control has a dual purpose: ▪ Rotate to control the horizontal waveform position. ▪ If the SETUP menu is visible, this control allows the user to select menu items.
28	V (WAVEFORM POSITION)	This control has a dual purpose: ▪ Rotate to control the vertical waveform position. ▪ If the SETUP menu is visible, this control allows the user to select the values of the displayed menu item.
29	VECTOR PHASE	Rotate to control the rotation of the composite vector display through 360°. This allows positioning of the tips of the display within the graticule targets that represent the correct phases for color bar test patterns.

Making Digital Video Measurements with the VTM-200

The VTM-200 monitors analog NTSC/PAL composite and serial component digital video.

Video adhering to the ITU-R BT.601/SMPTE 259 standards consists of three component channels multiplexed into a single data stream. The three components are luminance (or "Y") and two color difference signals (C_B and C_R). The color difference signals are similar to the more familiar analog color difference components B-Y and R-Y. The significant difference is in amplitude scaling, which leads to an important point to remember when measuring serial component digital signals: **All three components of a 100% signal will have the same maximum peak to peak amplitude.** The VTM-200 graticule shows this maximum legal excursion as 0 volt to +0.7 volt. For example, a 100% color bar signal with a white flag will have all three components (Y, C_B, and C_R), ranging from 0V to +0.7 V. Y channel blanking level is 0 volt, and both C_B and C_R blanking levels are 0.35 volt. If a 75% signal with a 100% white bar is viewed on the VTM-200, the Y channel will still range from 0 to +0.7 volt, since the 75% refers to color saturation. In this case, peak-to-peak excursion for the C_B and C_R channels will now be 75% of 0.7 volt, or 0.525 volt peak-to-peak. This range is centered on blanking level (0.35 volt), so **the maximum excursion of C_B and C_R with 75% saturation is 0.0875 volt to 0.6125 volt**. These are the only peak-to-peak excursions for the color difference channels; there are not the range of standards with serial component digital video that there are with analog component (Beta, MII, EBU, SMPTE, etc.). Amplitudes are the same in both 50 Hz and 60 Hz serial component digital video.

Another difference between viewing analog and digital component video is the blanking portion of the signals. Unlike analog, a digital component has no sync pulse or other synchronizing portion of the signal. There are synchronizing data words at the beginning and end of blanking, but these do not look like sync pulses. Only the active video portion of the signal is displayed on the VTM-200, but this is precisely controlled so that timing measurements can be made relative to the first displayed pixel. The first displayed pixel is the first active video sample after SAV (**S**tart of **A**ctive **V**ideo - the synchronizing words that appear at the end of blanking). A SETUP menu item allows for the display or blanking of spikes representing the SAV and EAV (**E**nd of **A**ctive **V**ideo) that indicate the beginning and end of each component.

The graticule scales change when displaying waveforms as RGB or composite signals. The RGB display is useful for gamut checking—**any portion of the signal that extends more negative that 0 volts or more positive than +0.7 volts in a RGB display is invalid and the cause of a GAMUT error.** Displaying an input as a composite signal is a quick check of its suitability for encoding. Still, 100% saturated signals will *not* encode properly. A quick check when displaying a composite waveform is to examine whether the chrominance extends above or below the luminance limits. Remember, **the peak luminance for 60 Hz signals is 0.714 volt, slightly above the 0.7 volt graticule line.**

GENERAL CHARACTERISTICS OF SERIAL COMPONENT SIGNALS

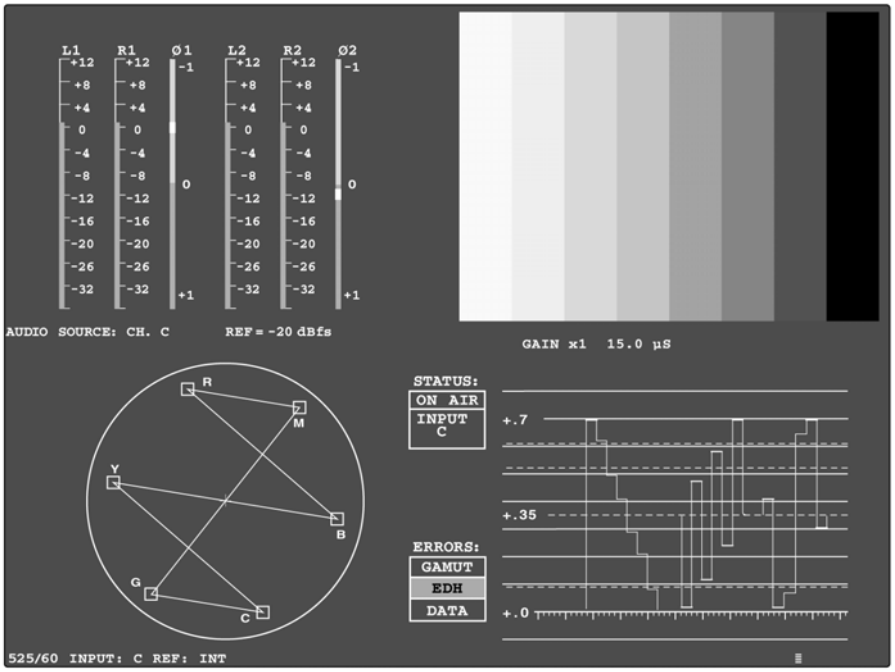
- Serial data rate: 270 Mb/s
- Serial digital signal amplitude: 800 mV p-p (Note: *not* video signal amplitudes)
- 1440 data words in active video
- 276 data words in horizontal blanking (525 line system)
- 288 data words in horizontal blanking (625 line system)
- Serial transmission uses 10-bit words but 8-bit words are allowed (lower two bits set to logical 0)

SUPER VGA (SVGA) Display

Figure 3-2 illustrates a four-quadrant display of a serial digital signal. The picture in the upper right quadrant indicates that the signal is a full field color bar test pattern. The waveform display in the lower right quadrant has been set to display the Y, C_B, and C_R components of the signal in a time-paraded fashion. Above the waveform, the vertical gain is indicated as being x1, and the horizontal waveform time scale is indicated as 15 μs per major division. In the lower left quadrant, the vector display shows the color content of the signal as a plot of C_B horizontally versus C_R vertically. The tie lines between targets within the circle indicate the transitions between colors in the test pattern. The STATUS is indicated between the waveform and vector displays. The signal is not ON AIR, because the ON AIR legend background is not illuminated in red. The SOURCE ID has been set to read INPUT C. The ERROR conditions shown are: no GAMUT error, EDH present, but no EDH errors are occurring; and no DATA errors are occurring. At the lower left of the vector display, the signal standard is indicated as 525 (lines per frame) / 60 (Hz vertical rate), the selected INPUT is again identified as being on connector C, and the selected REFRENCE (REF) is indicated as INTERNAL (INT). The audio levels display in the upper left quadrant.

The source of the audio is indicated as channel C, which is a serial digital source, with the REF set for -20 dBfs. This means that a digital audio signal at a level 20 dB below the analog level corresponding to the full scale value will be represented as a green bar extending from the bottom of a scale to the zero mark on the scale. The LEFT (L)1, RIGHT (R)1, L2, and R2 audio components of channel C are all at levels of 0 dB relative to the reference. The ϕ1 phase difference scale shows its yellow indicator mark as being in the upper red area between the 0 and -1 marks. This means that the phase difference between L1 and R1 is more than 90° (0 mark) and is approaching 180° (-1 mark). The implication is that the audio signals on L1 and R1 are either 2 independent monophonic channels, or that the signal polarity of one of them is reversed, if they really are a stereo pair. The ϕ2 phase difference scale shows the signals on L2 and R2 at a less than 90° phase difference.

Figure 3-2. Sample SVGA display



Waveform, Vector, and Audio Graticule Scales

Waveform Graticule Scales

The waveform graticule scales change according to the video format being displayed, as listed in **Table 3-2**.

Table 3-2. Video Formats and Units of Measure

Video Format	Unit of Measure
NTSC composite	IRE
PAL composite	Units or V (selectable)
Digital 525	V
Digital 625	V

Because of the large number of possible front panel control setting combinations, it is impractical to show every possible screen display. However, the following examples represent a cross section of what graticules and arrangements of displays can reasonably be expected.

Figure 3-3 illustrates a full-screen waveform graticule with no signal displayed. INPUT A has been selected, and the REF is internal. The signal standard is NTSC. The STATUS is not ON AIR, and the SOURCE ID has been set to read INPUT A. The SC/H phase is measured to be 0°. The vertical gain is x1, the horizontal time scale is 5.0 µs per major division, and the FLAT (FL) filter has been selected. The -40 and +100 IRE scale lines are indicated.

Figure 3-3. Full-Screen Waveform Graticule

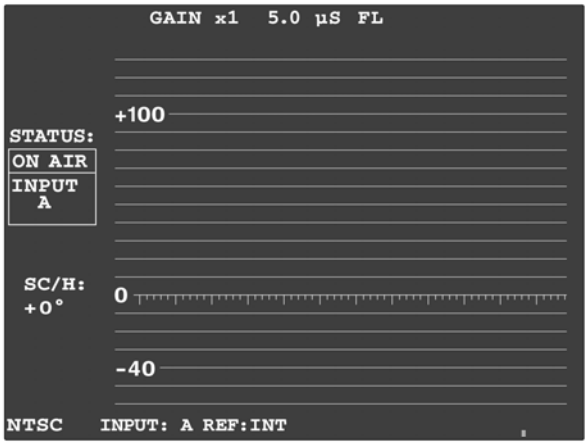


Figure 3-4 shows an unzoomed, full-screen vector display graticule with no signal displayed. INPUT A has been selected, and the REF is internal. The signal standard is NTSC. The STATUS is not ON AIR, and the SOURCE ID has been set to read INPUT A. The SC/H phase is measured to be 0°. **R**ed, **M**agenta, **Y**ellow, **B**lue, **G**reen, and **C**yan are targets for a color bar test pattern and the horizontally indicated area in which the back porch color burst should fall.

Figure 3-4. Unzoomed Full-Screen Vector Display

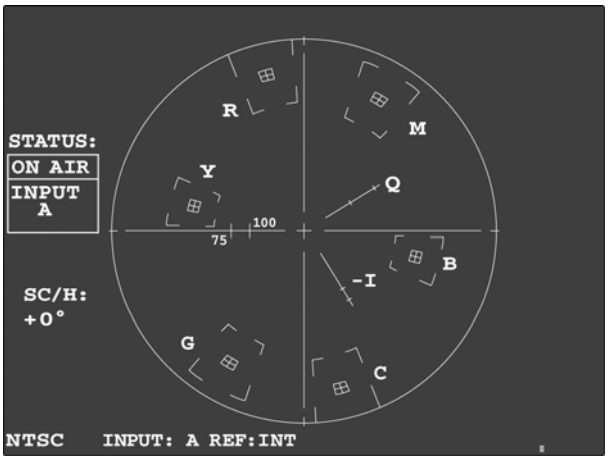


Figure 3-5 shows an unzoomed full-screen audio levels display with audio signals present. Audio channel A has been selected, and the 0 marks on the vertical scales correspond to the audio reference of +8 dBm. The STATUS is not ON AIR, and the SOURCE ID has been set to read INPUT A. The SC/H phase is measured to be 0°. The instantaneous level of audio source L1 is about 0 dB, and that of audio source R1 is +12 dB or more. L2 and R2 levels are about +8 and +1 dB. The phase differences between L1 and R1, and L2 and R2 are each less than 90°.

Figure 3-5. Unzoomed Full-Screen Audio Display

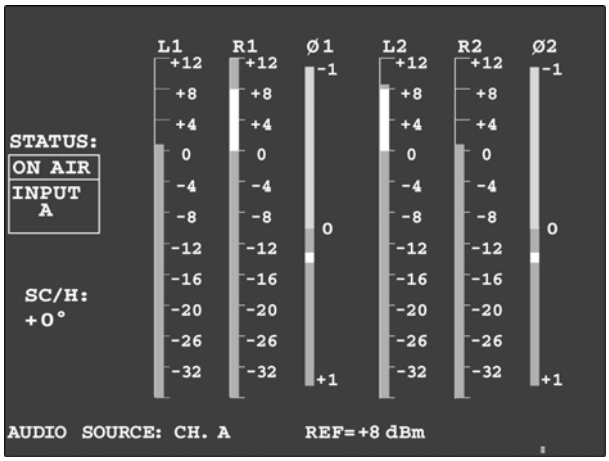


Figure 3-6 illustrates a four-quadrant display with no video signal present, and the (non-audio) SETUP menu displayed as a result of the front panel SETUP button having been pressed. The menu item displayed is Waveform Color, and the currently selected value for that item is Green. On-screen instructions indicate **"Choose an item with the H Pos knob. Change its value with the V Pos knob."** To select audio-related setup menu items, **"Press 'Audio Zoom' for audio setup."** To remove the SETUP menu, **"Press 'Setup' again to exit setup.**

Figure 3-6. Four-Quadrant Display without a Video Signal (Non-Audio Menu)

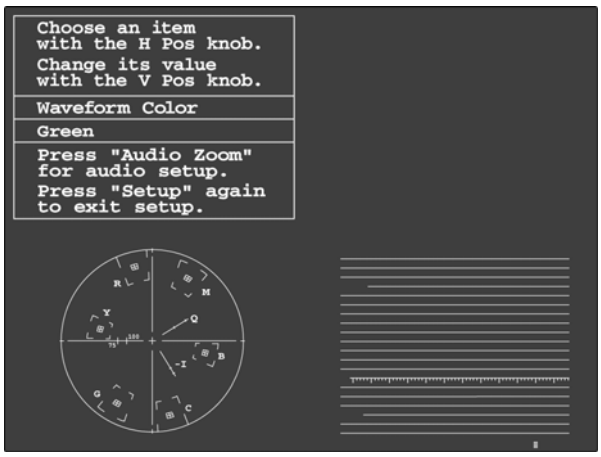


Figure 3-7 illustrates a four-quadrant display with no video signal present, and the (audio) SETUP menu displayed as a result of the front panel SETUP button having been pressed, followed by a press of the AUDIO ZOOM button. The menu area overwrites the vector display area. The selected menu item is Analog Audio Scale, and the selected item value is Type I (+8 dBm). By moving the menu area over the vector, the audio quadrant becomes visible so the effects of menu changes can be viewed before the menu is exited.

Figure 3-7. Four-Quadrant Display without a Video Signal (Audio Menu)

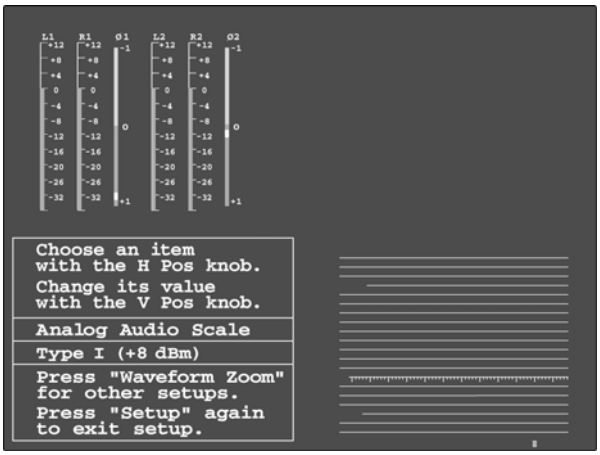


Figure 3-8 shows a four-quadrant display with no video signal present, and with audio present. The waveform graticule has been zoomed to the region around 0 IRE. The 7.5 IRE is a dotted graticule line that corresponds to picture black level. The vector graticule has been zoomed to the top left quadrant. The audio scales remain unzoomed. Audio channel A has been selected, and the 0 marks on the vertical scales correspond to the audio reference of +8 dBm. The STATUS is not ON AIR, and the SOURCE ID has been set to read INPUT A. The signal standard is NTSC. The SC/H phase is measured to be 0°. The vertical gain is x1, the horizontal time scale is 5.0 µs per major division, and the FLAT (FL) filter has been selected.

Figure 3-8. Four-Quadrant Display with Upper Left Vector

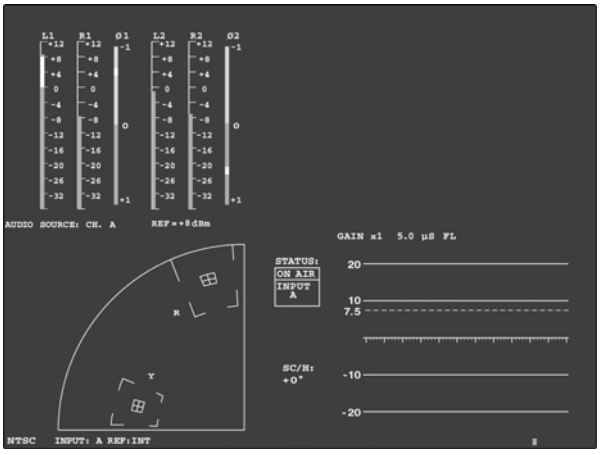


Figure 3-9 is similar to **Figure 3-8**, except that the waveform graticule has been zoomed to the region around 100 IRE, and the vector display has been zoomed to its lower right quadrant.

Figure 3-9. Four-Quadrant Display with Lower Right Vector

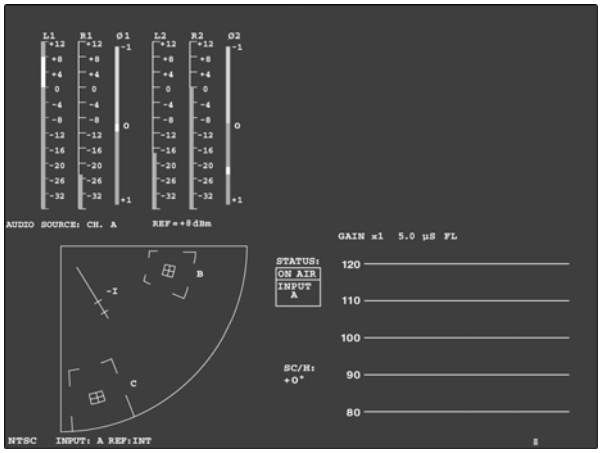


Figure 3-10 is similar to **Figure 3-8** and **Figure 3-9**, except that the waveform graticule is unzoomed, and the vector area has been zoomed to its center.

Figure 3-10. Unzoomed Display with Center Vector

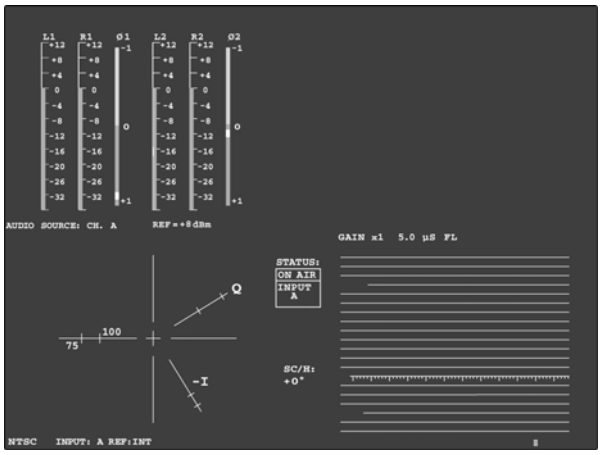
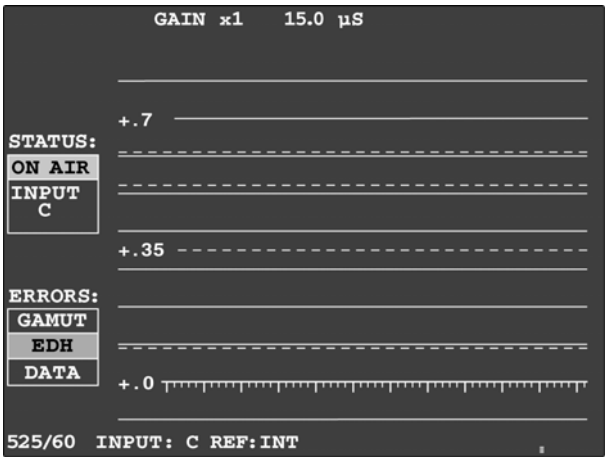


Figure 3-11 shows a full-screen waveform graticule set for a 525/60 serial digital input, but with no video signal shown. The gain is x1, and the horizontal scale is 15.0 µs per major division. The selected input is C, and the selected REF is internal. The ON AIR status has been set to indicate that the signal is on the air, and the SOURCE ID has been set for INPUT C, although any two lines of six characters could have been displayed. There are no GAMUT errors, EDH is present in the serial digital stream, and there are no DATA errors. The waveform graticule is calibrated in volts, with dotted lines corresponding to salient points in a component test waveform.

Figure 3-11. 525/60 Serial Digital Input Full-Screen Waveform Graticule



Vector Graticule Scales

The vector graticule scales also change according to the video format being displayed; these scales are illustrated in **Figure 3-12** and **Figure 3-13**.

Figure 3-12. NTSC Vector Graticule

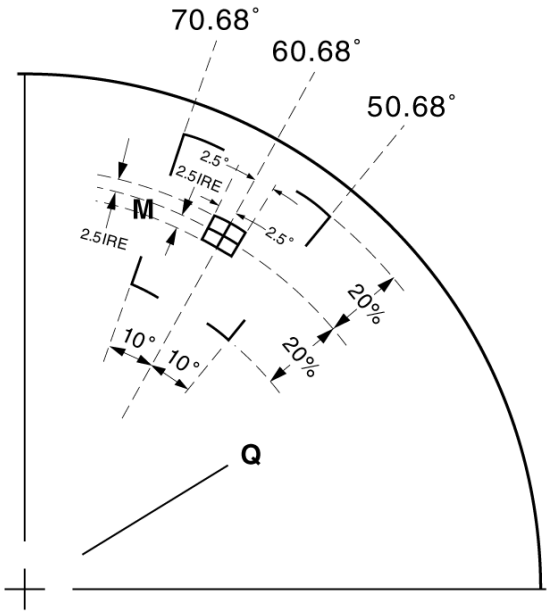
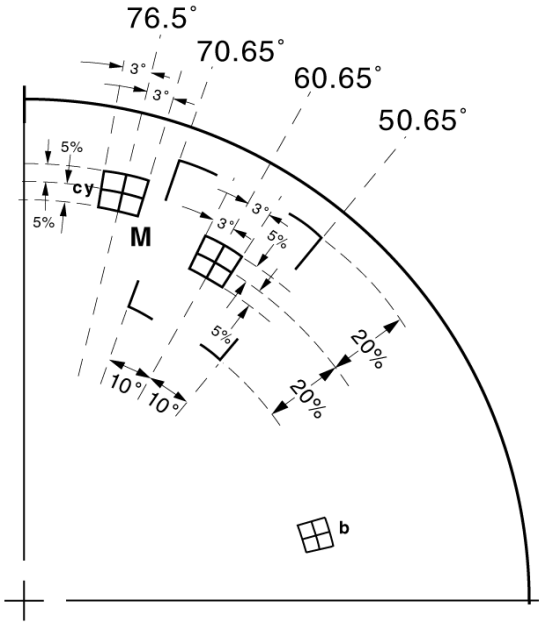


Figure 3-13. PAL Vector Graticule



Audio Ballistics

The audio display is an option. The audio levels are represented by bar graph level meters with characteristics selectable to be either IEC Type I, IEC Type IIa, IEC Type IIb, Type I +8, or Nordic for both analog and digital inputs; for digital inputs only, the dBfs scale is selectable. The IEC types are according to IEC-268-10 and -17 specifications. The graticules are calibrated in dB, and the selected reference level, (either 0, +4, +6, +8, or +12 dBm for analog audio inputs, or -22, -20, or -18 dBfs for digital audio inputs) corresponding to the 0 mark is listed, along with the audio source. In addition to the L1, R1, L2, and R2 level scales, there are ϕ1 and ϕ2 phase difference scales. ϕ1 measures the instantaneous phase difference between the signals applied to the L1 and R1 scales. ϕ2 measures the instantaneous phase difference between the signals applied to the L2 and R2 scales. The ϕ scales are calibrated in +1 (0°), 0 (90°), and -1 (180°) markings. The region between +1 and 0 is green; the region between 0 and -1 is red; a yellow indicator mark shows the phase difference.

The audio scales and ballistics both attack and delay times for meter movement. The following meter responses can be selected:

- NORMAL
- PEAK
- PEAK HOLD

Factory-Default Settings

When the VTM-200 is powered on for the first time, it assumes the factory-default settings. These default settings are listed in **Table 3-3**.

Table 3-3. Default Settings

Key	Menu Item	Default Value
1	Waveform Color	Lt. Green
2	Vector Color	Yellow
3	Background Color	Black
4	Graticule Color	White
5	Waveform Intensity	0
6	Vector Intensity	0
7	SAV/EAV Blanking	On
8	DC Restore	On
9	Persistence	Normal
10	Waveform Overlay	Parade
11	PAL Vector	Normal
12	Vector Horz Center	0
13	Vector Vert Center	0
14	Picture Enable	On
15	Picture Brightness	0
16	Picture Contrast	0
17	Picture Saturation	0
18	Picture Hue	0
19	Analog Vector	75%
20	CCIR-601 Vector	100%
21	Video Standard	Auto Detect
22	Baud Rate	38400
23	Cal	Off
24	Screen Saver	Off
25	PAL Waveform	Units
26	Audio Follow Input A	Audio Input A
27	Audio Follow Input B	Audio Input B
28	Audio Follow Input C	Audio Input C
29	Audio Follow Input D	Audio Input D
30	Audio Response	Normal (IEC 268-
31	Analog Audio Scale	Type I (+4 dBm)
32	AES/EBU Audio Scale	Type I (-20 dBfs)
33	Sum/Difference	L1 / R1 / L2 / R2

Video Inputs

The VTM-200 accepts two video formats: composite and serial digital.

Selecting Video Inputs

Press INPUT next to the A, B, C, or D. Pressing the INPUT button will cycle through a four-quadrant display:

- Full-screen display of the processing picture
- Full-screen waveform display
- Full-screen vector display
- (OPT-1 Option) Full-screen audio level display

NOTE: The video is in Parade mode. To change to Overlay mode, use the SETUP MENU.

Selecting Filters

There are three filters available: Flat, Low Pass, and Chroma. Press FILTER to select the next filter. Multiple filters can function simultaneously. Only the FLAT selection applies to the components of signals applied at the C or D video connectors. No filtering is ever applied to the vector display.

Selecting Sweep Modes

Press SWEEP to select one of the four sweep modes: 1H (1 Horizontal), 2H (2 Horizontal), 1V (1 Vertical), and 2V (2 Vertical). 1H or 1V SWEEP is possible when paraded components have been selected for display, the only a 1H or 1V SWEEP is possible. Overlaid components are shown in a 1H display, and paraded components are shown in a 3H display. If LINE SELECT is set to ON, then only 1H sweep is possible.

Selecting a Display Format

Press FORMAT to select one of three display formats: RGB, YC_BC_R, and COMPOSITE. **Table 3-4** lists the relationships between the input and display formats:

Table 3-4. Input and Display Format Relationship

Input/Format	RGB	YC_BC_R	Composite
Composite	No	No	Yes
Digital	Yes	Yes	Yes

1 Not available for RGB formats.

2 Available with YC input only.

AUDIO, VECTOR, and WAVEFORM ZOOM Buttons

There are three ZOOM buttons: WAVEFORM, VECTOR, and AUDIO. The following subsections explain their use.

Expanding the Audio Display

NOTE: This button is only active when the OPT-1 option is installed.

Press AUDIO ZOOM to select one of the display options:

- Expand the audio scales around the 0 dB reference point and enable increased resolution of readings.
- Select items in the SETUP menu that are only concerned with audio.
- Forces the SETUP menu to appear in the screen quadrant normally occupied by the vector display.

Expanding the Vector Display

Press VECTOR ZOOM to select one of five expanded display options:

- Expand the center
- Expand the upper-left quadrant
- Expand the upper-right quadrant
- Expand the lower-right quadrant
- Expand the lower-left quadrant

As with AUDIO ZOOM, the VECTOR ZOOM is helpful when increased resolution of phase or saturation readings is required.

Expanding the Waveform Display

Press WAVEFORM ZOOM to select one of three display options:

- NORMAL or no expansion display of –50 to +120 IRE
- ZOOM positioned with a center value of 0 IRE and going to +20 IRE
- ZOOM positioned on the 100 IRE and reaching to +120 IRE

At each zoom position, the graticule scale and waveform displays expand to provide more resolution around the zoom point.

Navigating the SETUP MENU

Press SETUP/LEARN to display or exit the SETUP MENU. Use the following knobs to navigate and select values on the SETUP MENU:

- WAVEFORM POSITION-H
  - Rotate the knob left or right to move the menu cursor or to change a value or condition in a menu.
  - Stop knob at desired item.
- WAVEFORM POSITION-V
  - Rotate the knob to change a selected value or move a graticule cursor line.
  - Stop knob at the desired value.

Enter the Setup mode to display the SETUP MENU.

Table 3-5. SETUP Menu

Menu Item	Item Values							
WAVEFORM COLOR	*16 colors							
VECTOR COLOR	*16 colors							
BACKGROUND COLOR	*16 colors							
GRATICULE COLOR	*15 colors							
WAVEFORM INTENSITY	-32 to +32							
VECTOR INTENSITY	-32 to +32							
SAV/EAV BLANKING	On				Off			
DC RESTORE	On				Off			
PERSISTENCE	Normal				Infinite			
WAVEFORM OVERLAY	Overlay				Parade			
PAL VECTOR	Normal				Overlay			
VECTOR HORZ CENTER	-128 to +127							
VECTOR VERT CENTER	-128 to +127							
PICTURE ENABLE	On				Off			
PICTURE BRIGHTNESS	-128 to +127							
PICTURE CONTRAST	-128 to +127							
PICTURE SATURATION	-128 to +127							
PICTURE HUE	-128 to +127							
ANALOG VECTOR	75%				100%			
CCIR-601 VECTOR	75%				100%			
VIDEO STANDARD	Auto Detect			NTSC (525/60)			PAL (625/50)	
BAUD RATE	300	1200	2400	4800	9600	19,200	38,400	
CAL	On				Off			
SCREEN SAVER	Off or 1–120 minutes							
PAL WAVEFORM	Units				Volts			
AUDIO FOLLOW INPUT A	CH. A		CH. B		CH. C		CH. D	
AUDIO FOLLOW INPUT B	CH. A		CH. B		CH. C		CH. D	
AUDIO FOLLOW INPUT C	CH. A	CH. B	CH. C	CH. D	** GR. 1	** GR. 2	** GR. 3	** GR. 4
AUDIO FOLLOW INPUT D	CH. A	CH. B	CH. C	CH. D	** GR. 1	** GR. 2	** GR. 3	** GR. 4
AUDIO RESPONSE	Normal			Peak			Peak Hold	
ANALOG AUDIO SCALE	Type I (0, 4, 6, 8, or 12 dBm)			Type IIa (0, 4, 6, 8, or 12 dBm)			Type IIb (0, 4, 6, 8, or 12 dBm)	
	Type I +8 (0, 4, 6, 8, or 12 dBm)				Nordic (0, 4, 6, 8, or 12 dBm)			

*Colors listed in the Display Colors Menu.

(Table continues on next page)

** Selection available only with OPT-2 installed.

Table 3-5 SETUP Menu (*continued*)

Menu Item	Item Values			
AES/EBU AUDIO SCALE	Type I (-18, -20, or –22 dBfs)	Type IIa (-18, -20, or -22 dBfs)	Type Iib (-18, -20, or -22 dBfs)	
	Type I +8 (-18, -20, or -22 dBfs)	Nordic (-18, -20, or -22 dBfs)	dBfs (-9, -18, -20, or -22 dBfs)	
SUM/DIFFERENCE	L1/R1/L2/R2	L1/R1/M1/S1	L2/R2/M2/S2	M1/S1/M2/S2

Display Colors Menu

Black

Blue

Green

Cyan

Red

Purple

Brown

LT Gray

DK Gray

LT Blue

LT Green

LT Cyan

LT Red

LT Purple

Yellow

White

NOTE: LT=Light and DK=Dark

Calibration Pulse

Checking on the accuracy of the waveform graticule and the vertical gain of the VTM-200 circuits that process composite waveforms, a calibration pulse is selected for display in lieu of the normal composite waveform. The SETUP menu item CAL has as the values ON and OFF. If CAL pulse is selected, a squarewave several cycles in duration will be displayed. The squarewave amplitude corresponds to 140 IRE in NTSC and 143 UNITS in PAL and is processed by the same circuits that normally process the composite waveform. By adjusting the squarewave position vertically with the front panel WAVEFORM POSITION-V knob, it should be possible to place the top and bottom of the squarewave directly on the -40 and +100 lines in NTSC and -43, +100 lines in PAL of the unzoomed waveform graticule, in order to verify calibration.

Calibration Interval

Calibration is recommended under any of the following conditions:

- Every 12 months
- When critical components are replaced
- After exposure to temperatures outside of the specified operating or storage temperatures

NOTE: If calibration is needed, refer to **Appendix B** for service and support.

STATUS, ERROR, and SC/H Indicators

Between the waveform and vector displays, and on full screen waveform and vector displays, the VTM-200 shows STATUS information, and for serial digital inputs only, ERRORS information. The background color that surrounds the indicating text provides the user with useful information, summarized in the tables that follow.

Definitions of the listed errors:

- GAMUT ERROR - When the transcoded RGB representation of a digital input extends above 0.7V or below 0V during the active picture portion of the video.
- DATA ERROR - When the presence of a signal is detected on a digital input but TRS (Timing Reference Sequence) cannot be detected.
- EDH ERROR - When the presence of the EDH header is detected and either the active picture or full field CRCs (Cyclic Redundancy Checks) calculated by the VTM-200 do not match the CRC values embedded in the selected digital video signal.
- EDH PRESENT - When there is no EDH ERROR and the VTM-200 has detected the presence of the EDH header on the selected digital video input.

Table 3-6. Status Indicators

Indicator	Background color	
ON AIR	clear – off the air	red – on the air
SOURCE ID	2 lines of text, 6 characters per line, entered from the keyboard at the user's option	

Table 3-7. Error Indicators (only visible for serial digital inputs)

Indicator	Background color		
GAMUT	clear – no errors	yellow – error(s)	
EDH	clear – EDH not present	green – EDH present, no errors	red – EDH present, error(s)
DATA	clear – no errors	red – error(s)	

The error indicators show an error for one second after the error condition ends. In addition to the above information, for NTSC or PAL inputs only, SC/H phase information is displayed. SC/H phase is defined as the phase of the color burst subcarrier relative to the leading edge of the horizontal sync pulse. The measurement is displayed as text, is in degrees, and is accurate to within ± 5°.

User-Interface Controls

Front Panel Buttons / GPI/TALLY Connector / Keyboard

The VTM-200 can be operated in three ways: by using the front panel push buttons directly; by contact closures applied to the back panel GPI/TALLY connector; or by a computer keyboard connected to the back panel KEYBOARD connector. Regardless of the source of control, the front panel indicators will accurately indicate the LAST SELECTION that was made.

Using the front panel:

1. Press the DISPLAY button to cycle through the four-quadrant display, and the full screen displays of the picture, waveform, vector, and audio levels.
2. Select the reference to be used by pressing the REF button.
3. Select one of the four input signals to be displayed by pressing the INPUT button.
4. Press FILTER to cycle through the available filters to be applied to the waveform display.
5. Press SWEEP to cycle through the time base options for the waveform display.
6. Horizontal and vertical magnifications are controlled via the H. MAG and V. GAIN buttons.
7. The waveform display formats are selected using the FORMAT button.
8. To zoom the audio display, press AUDIO.
9. To cycle the vector display through its six possible views, press VECTOR.

10. To cycle the waveform from normal to the zoomed displays around 0 IRE and 100 IRE, press WAVEFORM.
11. To change a user-settable parameter, press SETUP to display the on-screen menu selections. (See the VTM-200 SETUP MENU table in this manual for a listing of all possible menu items and their values).
12. To show just one selectable line of video on the waveform and vector displays, press the LINE SELECT button.
13. Choose the line to be displayed by turning the LINE rotary control in either direction.
14. Control the horizontal and vertical positions of the waveform with the H and V rotary controls.
15. The VECTOR PHASE rotary control allows for the rotation of the vector display in order to bring the vector tips into the target areas for burst and for color bar test patterns.

The GPI/TALLY connector may be used to provide momentary contact closures (from, for example, remotely located relays or switches) to select one of the four inputs, just as the front panel INPUT button does. It also allows for the control of the ON AIR status indicated on-screen.

Use a computer keyboard connected through a maximum of 25 feet of extension cable to the back panel KEYBOARD connector to control the unit. See **Table 3-8** for a listing of admissible keystrokes and their functionality.

The VTM-200 may have its flash ROM, which holds the program for its embedded microcontroller, updated by a computer via the COM connector, by cabling it to a serial COM port on the computer. The communications parameters are no parity, 8 data bits, and the baud rate is selectable via the SETUP menu to be in the range of 300 to 38,400.

Using the Keyboard Commands

Table 3-8 lists the keyboard commands used for remote operation of a single VTM-200 or multiple VTM-200 units. This table continues on the next page.

Table 3-8. Keyboard Commands

Function	Keystroke	Description
Ext Ref	R r	Toggles between Internal and External reference
Input	1	Selects Input A
Input	2	Selects Input B
Input	3	Selects Input C
Input	4	Selects Input D
Sweep Type	S s	Cycles through 1H, 2H, 1V, 2V
Filter	F f	Cycles through Flat, Lowpass, Chroma
Wfm Format	T t	Cycles through Y/Cb/Cr, RGB, Composite
Line Select	L l	Toggles line select
Line Select	[{	Decrement line number. In component display, choose prior channel.
Line Select	] }	Increment line number. In component display, choose next channel.
H mag	H h	Toggles horizontal magnification
V mag	J j	Toggles vertical magnification
Wfm Zoom	W w	Cycles through no zoom, zoom @ 0, zoom @ 100 IRE/0.7V
Vec Zoom	V v	Cycles through no zoom, center zoom, quadrants 2, 1, 4, and 3
Aud Zoom	A a	Toggles audio zoom
Vec Phase	, <	Rotate vector counterclockwise
Vec Phase	. >	Rotate vector clockwise
Wfm H pos	Home	Fast left
Wfm H pos	Left	Slow left
Wfm H pos	Pad 5	Center horizontal and vertical position
Wfm H pos	Right	Slow right
Wfm H pos	End	Fast right
Wfm V pos	PgUp	Fast up
Wfm V pos	Up	Slow up
Wfm V pos	Pad 5	Center horizontal and vertical position
Wfm V pos	Down	Slow down
Wfm V pos	PgDn	Fast down

(Table continues on next page)

Table 3-8 Keyboard Commands (*continued*)

Function	Keystroke	Description
Display	F1	Toggles between combo + menu and the prior mode
Display	F2	Full screen picture
Display	F3	Full screen waveform
Display	F4	Full screen vector
Display	F5	Full screen Audio
Display	F6	Quarter screen combination
Source ID	F10	Toggle source ID edit mode in which a cursor appears in the Source ID box. The cursor is a non-blinking underline. The unit will time out after one minute of keyboard inactivity to non-edit mode.
Source ID	Arrows	Move cursor.
Source ID	Backspace	Delete character at cursor and move cursor back.
Source ID	Other	If character is displayable, place it at the cursor.

Section 4 ♦ Troubleshooting

CAUTION — these instructions are for use by qualified personnel only. To reduce the risk of electric shock, do not perform this installation or any servicing unless you are qualified to do so. Refer all servicing to qualified service personnel.

If the VTM-200 is not functioning properly, first verify that:

1. The VTM-200 is connected to a power source (90–264 VAC, 50/60 Hz nominal).
2. All cables are correctly connected (see Section 2, "Installation").

Initial difficulties with operation or display can be due to improper setup. Review the SETUP MENU (see Section 3, "Operation") to ensure that the proper adjustments have been made for your signal requirements.

For information on troubleshooting the RCU-200, see Appendix D, "Remote Control Unit (RCU-200)."

Cold Starting the VTM-200

If the cables are correctly connected and the setup seems to be correct but the problem persists, perform a cold start**.**

NOTE: A cold start resets all front panel and SETUP MENU selections to their factory-default settings. All user settings are lost. See Section 3, "Operation," for the factory-default settings.

To perform a cold start:

1. Disconnect the AC power cord.
2. Wait 30 seconds.
3. Press and hold the SETUP BUTTON.
4. Re-apply power while holding SETUP.
5. Release the SETUP button after the graticules appear on the SVGA monitor.

A cold start will cause the default SETUP Menu items to be read from the flash ROM inside the unit. The default values will replace the custom setting selected. To see the default values in the setup menu refer to **Table 3-3** on page 3-14.

Problems, Causes, and Solutions

Table 4-1. VTM-200: Problems, Causes, and Solutions

Problem/Symptom	Possible Cause
No video visible on SVGA monitor.	▪ Output of VTM-200 not connected to SVGA 19 monitor. ▪ SVGA monitor has no power applied.
SVGA monitor cannot lock to VTM-200 output.	▪ Cable from VTM-200 to monitor not connected properly. ▪ Monitor not capable of 800 x 600 resolution or proper combination of horizontal and vertical rates. ▪ Incorrect serial digital format being applied.
VTM-200 graticule and display colors wrong.	▪ Check settings in SETUP menu.
VTM-200 graticules stable but display is unlocked.	▪ Check to see that input signal is applied to correct connector, and that it matches the standard selected (NTSC vs. PAL, 525/60 vs. 625/50). ▪ Input signal unterminated. ▪ Input signal is unstable. ▪ External reference selected with no external reference input.
Audio amplitude too small or too large.	▪ Audio levels and sensitivity not matched.
No audio display or menu options.	▪ Audio option not installed.
Portions of the display are not visible (off the VGA screen) or aspect ratio is incorrect.	▪ Horizontal and vertical position and size on the VGA monitor need adjustment

If the problem still exists after troubleshooting the VTM-200, see Appendix B, “Service Support,” for further instructions.

Appendix A ♦ Specifications

General

STANDARDS

Digital Inputs

- ITU-R BT.601 SMPTE 259M @ 270 Mb/s
- 50 Hz and 60 Hz field rates

Analog Inputs

NTSC/PAL (auto detect or user lockable).

MONITOR REQUIREMENTS

- Non-interlaced super VGA (SVGA) multisync monitor capable of 800 x 600 and 640 x 480 displays at a vertical rate of both 50 Hz and 59.94 Hz. (See OUTPUTS for additional requirements.)
- Composite video output for NTSC and PAL is an option.

DISPLAYS

Picture, Waveform, Vector and Audio simultaneously in a four-quadrant display, or a full-screen display of any of these separately.

WAVEFORM DISPLAY TYPES

Digital Inputs

- Waveforms derived from digital inputs may be displayed as native Y, C_B, C_R; as RGB; or as encoded composite (NTSC or PAL dependent upon input field rate).
- The vector is displayed as component C_R vs. C_B, or composite R-Y vs. B-Y.

Analog Inputs

- Waveforms derived from analog inputs may be displayed as composite only.
- Vectors are displayed as R-Y vs. B-Y.

TIME BASE FOR SWEEPS

- 1 or 2 lines; 1 or 2 fields; each sweep can be magnified x5.
- Parade and Overlay display modes for component displays are available.
- Overlaid components are shown in a 1H display.
- Paraded components are shown in a 3H display.

DISPLAY WAVEFORM ERROR

< 1%

WAVEFORM FREQUENCY RESPONSE

Y (luminance) channel

± 2% to 5.0 MHz

Cb and Cr channels

± 2% to 2.5 MHz

Composite

25 Hz to 6 MHz: ± 1% of 50 kHz

GENERAL (continued)

CHROMA FILTER RESPONSE	Within 3% of flat @ 3.58 MHz and 4.43 MHz.
SUBCARRIER PULL-IN RANGE	± 50 Hz of nominal Fsc
WAVEFORM GAIN	x1 and x2.5
TRANSIENT RESPONSE	Preshoot and/or overshoot < 2%
VECTOR ACCURACY	± 1°
VECTOR PHASE CONTROL	> 360°, continuously variable
SC/H PHASE MEASUREMENT ACCURACY	± 5° @ SC/H 0°
ALARMS	For digital inputs, an on-screen indication is given if any of the following errors occur: EDH error, gamut error, and data error.
STATUS	User provided on-screen display of ON AIR status and SOURCE ID.
AUDIO	On-screen display of user selected audio reference levels.
DISPLAY COLOR	Waveform, vector, graticule, and background colors are individually user-selectable.

Inputs

EXTERNAL REFERENCE	Two BNC loop-through input
EXTERNAL SYNC REQUIREMENTS	286 mV p-p NTSC/300 mV p-p PAL sync and burst ± 6 dB
ANALOG VIDEO	Two NTSC/PAL 75 Ω BNC inputs
ANALOG INTERNAL SYNC REQUIREMENTS	286 mV p-p NTSC/300 mV p-p PAL sync and burst ± 6 dB
ANALOG INPUT RETURN LOSS	≥ 45 dB, to 5 MHz
DIGITAL VIDEO	Two 75Ω BNC inputs

Inputs (continued)

DIGITAL VIDEO INPUT LEVEL 800 mV p-p ± 10%

DIGITAL VIDEO INPUT RETURN LOSS ≥ 18 dB, 5–270 MHz

AUDIO (optional)

- Four balanced analog stereo pairs may be applied at two push-on, mating connectors. Nominal levels of 0, +4, +6, +8 and +12 dBm (user selectable).
- Four single-ended AES/EBU digital audio stereo pairs on four 75Ω BNC inputs. Nominal levels of -18, -20, and -22 dBfs (user selectable).

AUDIO INPUT IMPEDANCE Analog inputs: 20 KΩ. Digital inputs: 75Ω.

DIGITAL AUDIO INPUT LEVEL 1V p-p ± 20%

Outputs

VGA A standard 15-pin, female, VGA connector provides analog R,G,B and horizontal and vertical sync pulses to operate an SVGA display.

RGB LEVELS 1V p-p nominal

RGB OUTPUT IMPEDANCE 75Ω

DISPLAYING NTSC OR 525/60

Horizontal Sync

- Negative TTL pulse, 3.2 μs duration ± 10%
- 37,463 Hz ± 1% rate for all displays except Full Screen Picture mode
- 31,470 Hz ± 1% rate for Full Screen Picture mode

Vertical Sync 59.94 Hz ± 1% rate for all displays

DISPLAYING PAL OR 625/50

Horizontal Sync

- Negative TTL pulse, 3.8 μs duration ± 10% for all displays except Full Screen Picture mode
- Negative TTL pulse, 3.4 μs duration ± 10% for Full Screen Picture mode
- 31,250 Hz ± 1% rate for all displays

Vertical Sync 50 Hz ± 1% rate for all displays

Outputs (continued)

AUDIO

Two analog stereo pairs (L1, R1; L2, R2), user selectable from among the audio input pairs, are available at a push-on, mating connector (with audio option installed).

AUDIO OUTPUT SIGNAL LEVEL

+4 dBm (600Ω balanced) ± 1 dB for any situation where the input level is equal to the selected reference level, except for the selection of the dBfs scale. When the dBfs scale is selected, the analog output level is -4 dBm ± 1 dB with a -20 dBfs input regardless of the selected reference.

AUDIO METER DISPLAY

Bar graph displays of L1, R1, L2, R2 audio channels

AUDIO METER ACCURACY

Non-Zoomed Display

- ± 1 dB for readings down to -26 dB
- ± 3 dB for readings of -30 dB and below

Zoomed Display

± 0.5 dB

AUDIO PHASE DIFFERENCE INDICATION

Differential phase displays for L1, R1 and L2, R2 are provided covering the range of 0° to 180°

Interface

COM

A standard 9-pin, female, “D” connector is available at the back panel to provide RS-232 serial data communication with an external computer.

RS-232/RS-422 COMMUNICATION PARAMETERS

- No parity, 8 data bits, 1 stop bit
- Supported baud rates: 300, 1200, 2400, 4800, 9600, 19200, 38400

KEYBOARD

A standard 6-pin, mini DIN connector is provided at the back panel. A computer keyboard up to 25 feet away from the VTM-200 may be used for remote control.

GPI / TALLY

- A standard 9-pin, male, “D” connector is available at the back panel.
- Momentary contact closures (> 0.5 seconds) may be used to select one of the 4 input signals for display, and to provide ON AIR status. (Input impedance is 10KΩ @ +5 VDC.) A contact closure (100 mA max., 50 VDC max.) provides error status summary.

Power Requirements

AC POWER SOURCE

90-264 VAC, 50-60 Hz

POWER CONSUMPTION

150 VA

Environmental

OPERATING TEMPERATURE 0° to +50°C

STORAGE TEMPERATURE -40° to +65°C

HUMIDITY 0 to 90% non-condensing

ALTITUDE
- Operating to 10,000 feet (3,050 meters)
- Non-operating to 50,000 feet (15,240 meters)

TRANSPORTATION 24 inch (9.5 cm) impact drop survivable in original factory packaging.

Mechanical

DIMENSIONS
- Height: 1.75" (4.45 cm)
- Width: 19.0" (48.26 cm)
- Depth: 19.75" (47.60 cm)

WEIGHT 15.6 lbs (7.1 kg)

Standard Accessories

STANDARD ACCESSORIES
- *VTM-200 Installation and Operation Handbook*
- 75Ω terminator

Options

OPTIONS
- OPT-1: Audio processing board for analog stereo, AES/EBU
- OPT-2: Analog stereo, AES/EBU, Embedded
- Composite video output for NTSC and PAL monitors.
- Service Manual
- WS-200: Total control through the PC

Specifications are subject to change without notice.

For RCU-200 specifications, see Appendix D, “Remote Control Unit (RCU-200).”

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Appendix B ♦ Service Support

For service support, telephone our Customer Service Department at **610-327-2292**. If the problem cannot be resolved over the telephone and the instrument must be shipped to Videotek for service or repair:

- Obtain a Return Authorization (RA) number.
- Attach a tag to the unit with:
  - Your company name, address, and telephone number
  - The name of the contact person at your company
  - The RA number
  - The unit serial number
  - An explanation of the problem
- To prevent shipping damage, repackage the unit in the same manner that it was received.
- Ship the unit to:

  Videotek
  243 Shoemaker Road
  Pottstown, PA 19464-6433
  Attn: Service Dept.

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Appendix C ♦ Pinouts

Figure C-1. VGA OUT 15-pin Female Connector

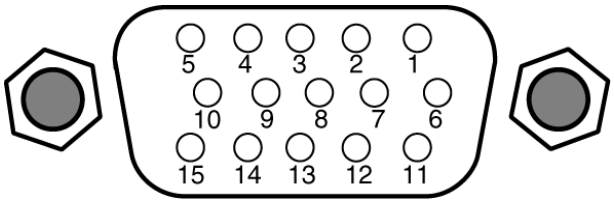

Table C-1. VGA OUT Connector Pinouts

Pinout	Signal
1	Red
2	Green
3	Blue
4	No Connection
5	Ground
6	Ground
7	Ground
8	Ground
9	No Connection
10	Ground
11	No Connection
12	No Connection
13	Horizontal Sync (negative pulse)
14	Vertical Sync (negative pulse)
15	No Connection
Shell	Chassis Ground

Figure C-2. RS-232/RS-422 COMM 9-pin Female Connector

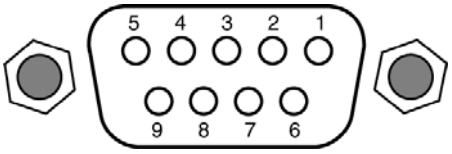

Table C-2. RS-232 COMM Connector Pinouts

Pinout	Signal (RS-232)	Signal (RS-422)
1	No Connection	No Connection
2	Transmit Data (*from* VTM-200)	Transmit Data - (*from* VTM-200)
3	Receive Data (*to* VTM-200)	Receive Data + (*to* VTM-200)
4	No Connection	No Connection
5	Signal Ground	Signal Ground
6	No Connection	No Connection
7	No Connection	Transmit Data + (*from* VTM-200)
8	No Connection	Receive Data - (*to* VTM-200)
9	No Connection	No Connection
Shell	Chassis Ground	Chassis Ground

Figure C-3. GPI/TALLY (CONTROL) 9-pin Male Connector

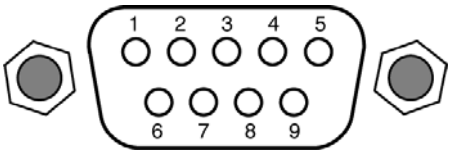

Table C-3. GPI/TALLY (CONTROL) Connector Pinouts

Pinout	Signal	I/O	Closure
1	Channel A Select	I	Momentary
2	Channel B Select	I	Momentary
3	Channel C Select	I	Momentary
4	Channel D Select	I	Momentary
5	N/A	-	N/A
6	ON AIR	I	Latched
7	Ground	I/O	Ground
8	Error Summary	O	Momentary
9	Error Summary Return	O	Ground Return

Figure C-4. Keyboard 9 Pin Female Connector

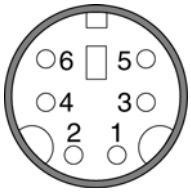

Table C-4. Keyboard Connector Pinouts

Pinout	Signal
1	Keyboard Data
2	No Connection
3	Signal Ground
4	+5 volts DC out
5	Keyboard Clock
6	No Connection
Shell	Chassis Ground

Figure C-5. Audio IN A and B Connector

Figure C-6. Audio OUT Connector

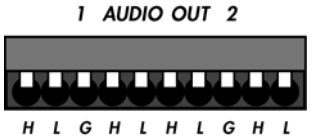

Table C-5. Audio Outputs and AES/EBU Audio Scales

ANALOG AUDIO LEVEL Menu Item	Gain at AUDIO OUT relative to AUDIO IN
0 dBm	+4 dB
+4 dBm	0 dB
+6 dBm	-2 dB
+8 dBm	-4 dB
+12 dBm	-8 dB

AES/EBU AUDIO SCALE Menu Item	AUDIO OUT relative to AES/EBU IN
Any scale other than dBfs (-22 dBfs ref)	+4 dBm out with -22 dBfs in
Any scale other than dBfs (-20 dBfs ref)	+4 dBm out with -20 dBfs in
Any scale other than dBfs (-18 dBfs ref)	+4 dBm out with -18 dBfs in
dBfs Scale	-4 dBm out with –20 dBfs in

Appendix D ♦ Remote Control Unit (RCU-200)

The RCU-200 remote control unit enables remote control operation of the VTM-200 or VTM-200L (VTM-200 with blank front panel).

Installing the RCU-200

Figure D-1. RCU-200 Back Panel Connectors

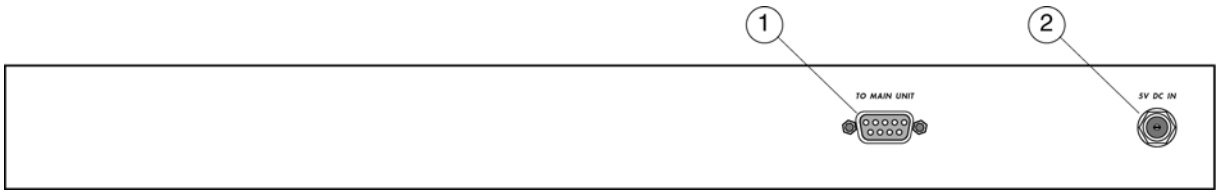

Table D-1. Description of RCU-200 Back Panel Connectors

Key	Label	Description
1	TO MAIN UNIT	9-pin, D-sub, male connector connects to the REMOTE connector on the VTM-200 to provide RS-422 communication; the communication parameters are 8 data bits, no parity, with the baud rate fixed at 38,400 bps.
2	5V DC IN	Connects to the DC power plug on the RCU-200 DC power supply; a knurled ring enables the power plug to be secured to the jack after the plug is fully inserted. This connection must be made before AC power is supplied.

The RCU-200 permits operation of the VTM-200 or VTM-200L (VTM-200 with blank front panel) from a remote location. It is a 19" rack-mounted unit powered by a small external power supply and connected to the main unit by a 9-conductor cable (25 foot, supplied) at a maximum of 80 feet (RS-232) or 1000 feet (RS-422). For configuration from a RS-232 signal connection to a RS-422 signal connection see RCU-200 COM Port Electrical Interface Selection on page D-2.

The RCU-200 front panel is identical to that of the VTM-200, and, with the exception of one restriction, all buttons, knobs and indicators have the same functionality as on the VTM-200 front panel. The restriction prevents the user from changing the data rate of the communication between the remote panel and the main unit.

To install the RCU-200:

NOTE: Inspect the shipping container of the RCU-200 prior to installation, and report any external or subsequent internal damage to the shipper.

1. Mount the RCU-200 with the enclosed rack mounting hardware.
2. Connect the DC power supply to the 5V DC IN on the back panel (secure it by hand-tightening the knurled collar).
3. Connect the end of the communications cable with the 9-pin, female, "D" connector to the 9-pin, male, "D" connector (marked TO MAIN UNIT) on the back

panel of the RCU-200, and secure it by tightening the captive screws. Route the cable as required and connect the other (male) cable end to the 9-pin COM (female) connector on the back panel of the VTM-200(L).

4. Connect the IEC connector end of the power cord to of the power supply and connect the other end to a properly grounded outlet. The RCU-200 will operate on nominal voltages of 115/230 VAC, 50 or 60 Hz.
5. When connecting an RCU-200 to a VTM-200 that previously operated as a stand-alone unit, the user should verify, using the VTM-200 SETUP menu, that the COM rate is configured for 38,400 bps, and that the VTM-200 firmware revision level is 1.8 or greater.

The data communication rate between the RCU-200 and the VTM-200(L) COM interface is 38,400 bps. This rate cannot be changed remotely by the RCU-200 or by commands issued to the VTM-200(L) over the COM interface. The data rate can be changed *only* by the VTM-200 front panel controls (via the VTM-200 SETUP menu) or by a sequence of keystroke commands from a standard AT keyboard connected to the 6-pin, mini DIN, KEYBOARD connector on the VTM-200(L) back panel. Transmission rates in the range of 300–38,400 bps may be selected in this manner.

Use of the RCU-200 does not preclude use of the VTM-200(L) COM interface for updating the VTM-200(L) flash ROM, which holds the firmware program for the VTM-200(L) embedded microcontroller. The flash ROM can be updated by cabling it to a 9-pin, serial, COM port on a PC capable of running the necessary update software. The communications parameters are 8 data bits, no parity, with 1 stop bit.

RCU-200 COM Port Electrical Interface Selection

CAUTION — these instructions are for use by qualified personnel only. To reduce the risk of electric shock, do not perform this installation or any servicing unless you are qualified to do so. Refer all servicing to qualified service personnel.

The COM interface on the VTM-200 as well as the Remote Control Unit (RCU-200) are factory configured to use an EIA-232 electrical interface for communications. Both the RCU and the VTM units are capable of utilizing an alternate cable interface, RS-422, which permits longer inter-unit cabling distances. In order to support an RS-422 connection the internal jumpers must be reconfigured. See Interface Mode Jumper Configurations for more details.

Interface Mode Jumper Configurations

In order to utilize the RS-422 interface, internal jumpers in both the VTM and RCU units must be repositioned. **Table D-2** details the jumper configuration for the RCU-200. All signal and power cabling should be removed from the units before disassembly. The jumpers on the RCU-200 are located near the back connector area of the VTM204 board.

Table D-2. Jumper Configuration for RS-422 Interface (RCU-200)

Connection	Jumper CN7	Jumper CN8
EIA-232	Connect 1-2	No connection
RS-422	No connection	Connect 1-2

Operating the RCU-200

Operating the RCU-200 is the same as operating a VTM-200.

Troubleshooting

Table D-3. RCU-200: Problems, Causes, and Solutions

Problem/Symptom	Possible Cause	Solution or Explanation
No LEDs are illuminated.	DC power supply cable is not properly connected to back panel 5V DC IN connector.	Properly connect the DC power supply.
	DC power supply has no AC power applied.	Apply AC power.
INPUT LEDs flash in alternate pairs (e.g., A+D and B+C); no other LEDs are illuminated.	Cable from VTM-200(L) to RCU-200 is defective or not properly connected.	Check the cable and the connection.
	VTM-200 is not powered up.	Apply power to the VTM-200.
	VTM-200 is not selected.	Select a VTM-200.

If the problem still exists after troubleshooting the RCU-200, see Appendix B, "Service Support," for further instructions.

Specifications

Interface

COM — 9-pin, male, D-connector (marked TO MAIN UNIT) on the back panel of the RCU-200 provides the interface point for the cable connection to the VTM-200. Interface levels are factory set for the EIA-232 electrical interface, but can be configured to RS-422 electrical interface. This permits use of cable lengths with a maximum of 50 feet (EIA-232) and 1000 feet (RS-422). A 25-foot interface cable is normally provided.

Power Requirements

AC power source — 115–230 VAC, 50/60 Hz. DC power is supplied to the 5 VDC IN jack on the back of the RCU-200 via a short power cable from an external power supply (provided).

Power consumption — Less than 30 VA

Environmental

Operating temperature	0° to +50°C
Storage temperature	-40° to +65°C
Humidity	0 to 90% (non-condensing)
Altitude	▪ Operating: to 10,000 feet (3,050 meters) ▪ Non-operating: to 50,000 feet (15,240 meters)
Transportation	24” (9.5 cm) impact-drop survivable in original factory packaging

Mechanical

Dimensions	Height: 1.75" (4.45 cm) Width: 19.00" (48.26 cm) Depth: 2.41” (6.12 cm)
Weight	1.6 lb (0.73 kg)

Standard Accessories

Standard Accessories	▪ *VTM-200 Installation and Operation Handbook* ▪ DC power supply (115/230 VAC, 50-60 HZ capability) with detachable AC power cord ▪ 25 foot RCU-200/VTM-200(L) interface cable

Options

Options	*VTM-180 & VTM-200 Service and Instruction Manual*

Specifications are subject to change without notice.

Pinouts

To Main Unit

Figure D-2. RCU-200 TO MAIN UNIT 9-pin Male Connector

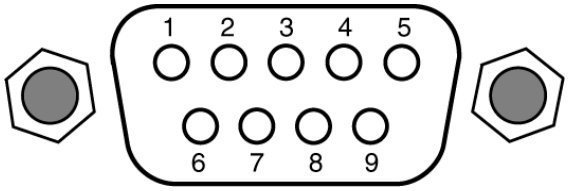

Table D-4. Pinouts for RCU-200 TO MAIN UNIT Connector

Pinout	EIA-232 Signal
1	N.C.
2	RX- (from VTM-200)
3	TX- (to VTM-200)
4	N.C.
5	GND
6	N.C.
7	NC
8	NC
9	N.C.
Shell	Chassis GND

Pinout	RS-422 Signal
1	No Connection
2	RX - (*from* VTM-200)
3	TX + (*to* VTM-200)
4	No Connection
5	Signal Ground
6	No Connection
7	RX + (*from* VTM-200)
8	TX - (*to* VTM-200)
9	No Connection
Shell	Chassis Ground

The RCU-200 electrical interface can be configured for RS-422 via internal pin jumpers for use with VTM-200(L) units having RS-422 interface capability. The RCU-200 is factory-configured with an EIA-232 electrical interface. Connecting an RCU-200 configured for RS-422 with a VTM-200(L) using an EIA-232 interface (or vice versa) will result in erratic operation, or no operation, and, possibly, damage to both units.

5 VDC IN

This coaxial jack mates with the DC power plug from the RCU-200 DC power supply. A knurled ring allows the power plug to be secured to the jack once the plug has been fully inserted. The plug should be connected to the RCU-200 *before* AC power is supplied to the power supply.

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Appendix E ♦ Glossary

601 An international standard (ITU-R BT.601) for component digital television. It defines the sampling systems, matrix values, and filter characteristics for digital television.

8 VSB Vestigial sideband modulation with 8 discrete amplitude levels.

16 VSB Vestigial sideband modulation with 16 discrete amplitude levels.

Advanced Television Systems Committee (ATSC) The parent organization that developed, tested and described the form and function of the US digital television formats.

AES/EBU A digital audio standard established jointly by the Audio Engineering Society (AES) and the European Broadcasting Union (EBU).

Artifacts Unwanted visible effects in the picture created by disturbances in the transmission or image processing, such as edge crawl or 'hanging dots' in analog pictures or 'pixelation' in digital pictures.

Aspect Ratio The ratio of horizontal to vertical dimensions. A square has an aspect of 1:1 since the horizontal and vertical measurements are always equal. Current television screen aspect ratios are 4:3 and 16:9.

Asynchronous Serial Interface (ASI) A transmission method adopted by the DVB, and called DVB-ASI. The transmission method allows for the transport of varying data payloads in a constant data stream. The DVB-ASI transport stream rate is 270 Mb/s.

Audio Breakaway Routing video and accompanying audio in separate signal paths.

Audio-Follow Routing video and accompanying audio together in the same signal path.

Auto Trans Automatic transition. The execution of a single wipe or fade from current picture to another picture by way of an automatic device.

Bandwidth The range of frequencies used to transmit information such as picture and sound.

Baseband Video An unmodulated video signal.

Black Also color black, blackburst. A composite color video signal that has the composite sync, reference burst, and a black video signal.

Blanking Processor A circuit which removes sync, burst and blanking from the program video and then replaces it with sync, burst and blanking from the reference input. The process ensures constant sync and burst levels on program video.

Border An electronically-generated picture member which is used in wipes to separate the two video sources used in the wipe. It is of even thickness and has color produced by the matte generator.

Broadcast Legal Encoding video signal parameters to conform to prescribed limits for broadcast. Encoding rules vary by NTSC, PAL, country and broadcast facility.

BTSC Broadcast Television Standards Committee. A US standard for stereo audio encoding in NTSC broadcast television.

CAV Component Analog Video

CES Consecutive Errored Samples

Composite Video A single video signal that includes all color video and timing information. A composite signal includes luminance, chrominance, blanking pulses, sync pulses and color burst information.

Chrominance The color portion of a video signal that represents the saturation and hue. Black, gray and white have no chrominance; color signals have both chrominance and luminance.

CH Chroma

Chrominance/Luminance Delay (C/L Delay) A measurement that indicates the amount to which chrominance and luminance are aligned with respect to each other. A low C/L delay figure can minimize the effects of ghosts or color offset on the received picture.

Clipping The electronic process of shearing off the peaks of either the white or black excursions of a video signal for limiting purposes. Clipping is often performed prior to modulation to limit the signal.

CMRR Common Mode Rejection Ratio

Color Burst The portion of a color video signal which contains a short sample of the color subcarrier. It is used as a color synchronization signal to establish a reference for the color information following it and is used by a color monitor to decode the color portion of a video signal. The color burst acts as both amplitude and phase reference for color hue and intensity. The color oscillator of a color television receiver is phase locked to the color burst.

Composite Sync A signal consisting of horizontal sync pulses, vertical sync pulses and equalizing pulses only.

Crosspoint An electronic switch, usually controlled by a button on the panel. Control logic will allow for only one crosspoint, for each bus, to be switched "ON" on at a time.

D/A Conversion of digital to analog signals.

DA Distribution Amplifier

Data Element An item of data as represented before encoding and after decoding.

Decoded Stream The decoded reconstruction of a compressed bit stream.

Decibel (dB) A logarithmic measure of the ratio between two powers, voltages, currents, sound intensities, etc. Signal-to-noise ratios are expressed in decibels.

Default A factory preset value or condition

Demodulator A receiver, such as for television broadcast, cable, and closed circuit applications. A TV demodulator receives and processes of f-air or cable RF signals and provides baseband video and audio outputs.

Differential Gain A measurement that specifies how much the chrominance gain is affected by the luminance level. Expressed as a percentage showing the largest amplitude change between any two levels, it indicates how much color saturation variance occurs when the luminance level changes.

Differential Phase A peak-to-peak measurement that specifies the extent to which the chrominance phase is affected by the luminance level. Expressed in degrees of subcarrier phase, it indicates how much hue shift occurs with luminance level changes.

Digital Video Broadcasting (DVB) A specific project office of the European Broadcast Union. This group has produced a set of digital broadcasting standards.

DSK Down Stream Key, a keyer which is electronically located after (or down stream from) all other functions of a switcher. The key resulting will appear to be on top of all other pictures from the switcher.

D-VITC Digital Vertical Interval Time Code. Timecode information stored on specific lines in the vertical blanking interval of a television signal.

EAV End of active video in component digital systems

EBU European Broadcasting Union

Editor A device or system which controls video tape recorders, video switchers, and other related devices in order to electronically splice segments of recorded video into a finished production.

EDH Error Detection and Handling. A recommended practice defined in SMPTE RP 165. A system to generate and then detect video data errors in serial digital video systems.

Effects Keyer A keyer which is electronically located in the mix/wipe generator portion of a switcher. The resulting key would appear under the down stream key.

EIA Rack Space or Unit A specific size as designated by the Electronics Industry Association. The rack unit is 19 inches wide, and is 1.75 inches tall. A device which requires 3 EIA rack units is 19 inches wide and 5.25 inches (3x1.75 = 5.25) tall.

Elementary Stream (ES) A generic term for one of the coded video, audio or other variable length bit streams which are packetized to form MPEG-2 transport streams. Consists of compressed data from a single source (audio, video, data, etc.). One elementary stream is carried in a sequence of PES packets with one and only one stream ID.

Embedded Audio Digital audio information multiplexed onto a serial digital data stream. Up to sixteen channels can be multiplexed on a single stream of 601 video, minimizing cabling and routing requirement.

ENG Electronic News Gathering

Encoded Clip Softness In the encoded legalization process, "softness," as applied to encoded clips, refers to the processing of the video at the point of the clip. The clips are applied in YC_BC_R color space. The clip point is either an immediate limit (no softness) or will have a range of values leading to the clip point, all reduced to smooth the clip point to a less immediate limit (softness).

Encoded Legalization Limiting of the luminance and color difference signals such that, once encoded into a composite video signal, the resultant encoded video does not violate the maximum or minimum signal levels as defined by the specific encoding rules. NTSC and PAL video plus various users of these types of video have many varied rules for maximum and minimum encoding limits. Encoded legalization usually calculates first the encoded luminance value and then the corresponding chroma value to make legalization judgements.

Encoded Video A combined single video signal that is constructed from either separate RGB or luminance and two color difference video signals. NTSC, PAL, and SECAM are all examples of encoded video.

Envelope Detection An RF signal detection technique that does not respond to phase variations in the carrier signal, enabling measurement of a transmitter's incidental phase. When used together with synchronous detection, envelope detection helps isolate either video and/or RF as the causes of phase distortion.

External Key Input This is an alternate source for key cut. This is usually a separate external input to a switcher

Fade-thru-Black (FTB) A production technique which is a two step process. The first step will fade the program video to black. The second step will fade from black to the video selected on the preview bus. This is usually used in major scene transitions.

Fade-to-Black (FTB) A production technique which simply fades the program video to black and program audio to silent. This is used to end programs and to escape from embarrassing pictures or sounds.

Field A picture or picture portion which is produced within one cycle of vertical synchronization. In interlaced systems, a full picture or frame requires two consecutive fields.

FM Trap A circuit designed to minimize potential interference from strong FM signals in receiving equipment, such as a TV demodulator. For example, an FM trap can attenuate signals between 88-108 MHz to reduce interference on NTSC television channel 6.

Frame A single full resolution picture as viewed in either a video or film system. In the case of interlaced video, two consecutive fields provide all of the information of one frame. In non-interlaced systems, one cycle of vertical synchronization produces a frame. A 60 Hz interlaced system, produces 30 frames of video in one second. A 60 Hz progressive (or non-interlaced) system, produces 60 frames of video in one second. Common frame rates are 24 (film) 25, 29.97, 30, 50, 59.94 and 60.

Frame Synchronizer An electronic device that synchronizes two or more video signals. Using one input as a reference, it locks a second signal to the reference.

Frame Store An electronic method of capturing and storing a single frame of video.

Gamma This term applies to the linearity of the change from black to white. Gamma controls adjust the gray or 50% point of the video either up or down, with the effect of changing the gray level of the video.

Gamut The whole or total of whatever is being addressed. In color space, gamut refers to all colors which are included in a particularly defined color group, such as 601 gamut.

Genlock (Generator Lock) A method of synchronization involving the generation of a video signal that is time and phase locked with another signal.

GPI General Purpose Interface

Headend In a cable TV system, the facilities where program sources (satellite, terrestrial, VTR, local) are received and remodulated for distribution through a cable plant.

High Definition Television (HDTV) High definition television has a resolution of approximately twice that of conventional television in both the horizontal (H) and vertical (V) dimensions and a picture aspect ratio (H to V) of 16:9.

High Level A range of allowed picture parameters defined by the MPEG-2 video coding specification which corresponds to high definition television.

HRC Harmonically-Related Carrier

Hue Color tint

ICPM Incidental Carrier Phase Modulation. A measurement of picture carrier phase distortion (affected by the video signal level) that occurs in the transmitter.

IRC Incrementally-Related Carrier

I.R.E. Refers to the Institute of Radio Engineers, and is used as a unit of measurement. In NTSC television, 1 volt of signal equals 140 IRE units.

Key An effect in television where a selected portion of background video is removed and replaced with another video.

Key Cut In a key effect, this is the video which designates the portion of background video which is removed.

Key Fill In a key effect, this is the video which is used to replace the portion of background video which was removed. This may be the same video as the Key Cut video.

Key Invert In a key effect, this is an electronic action which reverses the polarity of the key cut signal. It makes black appear as white, and white appear as black.

Key Mask In a key effect, it uses a wipe pattern from the wipe pattern generator to restrict the key cut from removing video in a portion of the screen. This requires the use of the wipe pattern generator and the Mask/Preset Size controls.

Key Source Another term which is the same as key cut.

Legalization The modification of serial digital video to conform to analog color space rules, as required by users.

LCD Liquid Crystal Display

LED Light-Emitting Diode

LFE Low Frequency Effects

LTC Longitudinal Time Code. A SMPTE timecode standard usually recorded onto the linear audio track of a VTR.

Luminance The degree of brightness (black and white portion of the video signal) at any given point in the video image. A video signal is comprised of luminance, chrominance and sync. If luminance is high, the picture is bright and if low the picture is dark. Changing the chrominance does not affect the brightness of the picture.

Main Level A range of allowed picture parameters defined by the MPEG-2 video coding specification with maximum resolution equivalent to standard definition television.

Main Profile A subset of the syntax of the MPEG-2 video coding specification that is supported over a large range of applications. Applications include, MP@HL (Main profile at high level) and MP@ML (Main profile at main level).

Mask/Preset Size Uses the wipe pattern generator in the keyer portion of the effects generator. This is used to adjust the size of a preset pattern or for adjusting the size of a mask to block a portion of the key cut (source) from use in the keyer.

Matte Generator An internal generator which can make any color, is used for border color and may be used for key fill. It is identical to the Color Background Generator, but simply used in other areas of the switcher.

Mbps Megabits per second

mV Millivolts

M/E Mix/Effects System

MP@HL Main Profile at High Level

MP@ML Main Profile at Main Level

MPEG Refers to standards developed by the ISO/IEC JTC1/SC29 WG11, Moving Picture Experts Group.

MPEG-2 Refers to ISO/IEC standards 13818-1 (Systems), 13818-2 (Video), 13818-3 (Audio), and 13818-4 (Compliance).

Multi-Level Effects Applies to any effects generator which can do more than one effect at a time. Typically, a multi level switcher can produce a Key and a Background transition in the same effects generator at one time.

NTSC National Television Systems Committee. The color television system used in the United States, Canada, Mexico and Japan.

Packet Identifier (PID) A unique integer value used to associate elementary streams of a program in a single or multi-program transport stream.

Packet A packet consists of a header followed by a number of contiguous bytes from an elementary data stream. It is a layer in the system coding syntax.

Packetized Elementary Stream (PES) The data structure used to carry elementary stream data. The packets consist of a header followed by payload data, and a stream is a series of packets which form an elementary stream and have a single stream identification.

PAL Phase Alternation Line; the standard color television system in many European and other countries.

Passive Looping Video and audio signals routed through components, even if power is removed. Signals are not amplified or processed, maintaining transparency.

Pedestal Level An offset used in a video system to separate the active video from the blanking level by maintaining the black level above the blanking level by a small amount.

Pixel A Picture cell or Picture element representing one sample of picture information, such as an individual sample of R, G, B, luminance or chrominance.

Preset Refers to establishing any condition prior to use on the Program output. This term is used in reference to wipe patterns and is often interchanged with Preview.

Preview The video output channel used to view the intended Program results prior to the execution of the next transition.

PRO Audio A transmitted audio channel for talent cueing via Interrupt Foldback (IFB) to ENG vans and remote applications. Some demodulators support PRO audio monitoring.

Program A transport stream combination of a video stream and one or more audio and data streams associated with that video stream. In analog terms, “Program” refers to the Base Band video and audio produced by the final output of a switcher.

Program Association Table (PAT) A list of all programs that are in the ATSC data stream.

Program Map Table (PMT) A listing of all elementary streams that comprise a complete (television) program.

Program Clock Reference (PCR) This is a time reference signal that is placed in MPEG streams for the purpose of time coordinating various data streams.

Program and System Information Protocol (PSIP) Information sent out as part of an ATSC transport stream which lists all of the video, audio, data and program information contained in the stream. This is the "TV guide" for a given stream.

Progressive Scanning Also non-interlaced. A system of video scanning where lines of a picture are transmitted consecutively, such as with VGA monitor displays.

Push-push Toggle Switch An electro-mechanical device which, when pushed, alternates the condition of the switch. Push once, it's off, push again, it's on.

Quadrature Output An output in a television demodulator used for measuring Incidental Carrier Phase Modulation (ICPM) in a transmitter.

QPSK Quadrature Phase Shift Keying; typically used by satellite downlinks.

QAM Quadrature Amplitude Modulation; the technique used by cable TV systems (64-QAM and 256-QAM) to remodulate signals for distribution in a cable plant.

RGB Legalization Limiting of luminance and color difference video signals such that, once transcoded into RGB component video signals, the resultant video does not violate the maximum or minimum signal levels as defined by component video level rules. Typically, the maximum value for R, G, or B is 700 mV, and the absolute minimum value for any of these signals is 0 mV.

Reclocking The process of regenerating digital data with a clock recovered from the input data.

Resolution A measure of the finest detail that can be seen, or resolved, in a reproduced image.

Sampling Process by which an analog signal is sampled to convert the analog signal to digital.

SAP Secondary Audio Program; used in television broadcast for second language broadcasting, simulcasting, and separate audio programming.

Saturation Color intensity

SAW Filter Surface Acoustic Wave filter

Segment Error Rate (SER) A calculated average of uncorrected transport stream packets vs. total packets as accumulated over a designated period of time.

Signal to Noise Ratio -Analog (SNR) A measurement of the noise level in a signal expressed in dB (decibels) as a ratio of between the audio or video signal's maximum peak-to-peak signal voltage and the measured voltage of noise present when the signal is removed. Higher SNR figures indicate that any noise introduced by system components will not be perceived in the picture and sound output signals.

Signal to Noise Ratio-8VSB (SNR) As applies to 8VSB transmissions, this is a calculated average power of the ideal signal divided by the actual demodulated signal power.

SMPTE Society of Motion Picture and Television Engineers

Standard Definition Television (SDTV) This term is used to signify a digital television system in which the quality is approximately equivalent to that of NTSC. This equivalent quality may be achieved from pictures originated at the 4:2:2 level of ITU-R BT.601 and subjected to processing as part of the bit rate compression. The results should be such that when judged across a representative sample of program material, subjective equivalence with NTSC is achieved. The displayed picture may be either the traditional 4:3 or the wide-screen 16:9 aspect ratio.

STL Studio-Transmitter Link

Synchronous Detection A common detection technique used in television demodulators that removes quadrature distortion, enabling comparison of transmitter output with video input signal.

S-Video Also Y/C. Transmits luminance and color portions separately via multiple wires, thus avoiding the color encoding process and resulting loss of picture quality.

Tally A system used to light lamps and indicate usage. Most production switchers have an internal tally system to indicate selected functions, and which selected functions are currently involved with Program.

TCP Transmission Control Protocol

Telecine A device used to convert film to video; movie film is digitally sampled and converted to video frame by frame in real-time.

TCXO Temperature Compensated Crystal Oscillator

THD Total Harmonic Distortion

Transport Stream-ATSC (TS) Consists of the following: (1) Packets: 188 bytes - fixed length with descriptive data, (2) Carries several programs, (3) has a PID which identifies the type of TS packet (video, audio, other), and (4) carries descriptive information about the program.

UHF Ultra High Frequency

Unity Gain An electronic term indicating that a signal will be neither amplified or attenuated. One volt of signal level in results in one volt of signal level out.

Vector A measure that has two individual properties: magnitude and direction.

Vector Clip A special encoded clip version that limits only the C_B and C_R input video signals and does not affect (nor is it affected by) the luminance component. This color-only clip limits the maximum vector excursions as viewed in an encoded state and is intended for users who wish to prevent encoded vectors from ever exceeding the perimeter circle of an encoded vector display.

VHF Very High Frequency

VITC Vertical Interval Time Code. A method for recording on to video tape the timecode address for each video frame inserted in the vertical interval.

Waveform A visual representation of a signal in the shape of a wave that plots amplitude versus time.

White Level The brightest part of a video signal, corresponding to approximately 1.0 Volt.

White Balance An electronic process used to calibrate the picture for accurate color display in different lighting conditions.

Wipe A special effect in which two pictures from different video sources are displayed on one screen. Production switchers and special effects generators provide numerous wipe patterns varying from simple horizontal and vertical wipes to multi-shaped, multi-colored arrangements.

XGA High resolution 1024x768 non-interlaced (progressive) display monitor.

YC_BC_R CAV format composed of luminance (Y) and two color difference signals (C_B and C_R).

Y/C Also S-video. Describes the separation of video signal luminance and chrominance components.

Zero Carrier Pulse (chopper) In a TV demodulator, removes the carrier in the vertical interval for a short period, enabling depth of field measurement.

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